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Nr. 2. A. C. Johansen: CONTRIBUTIONS TO THE BIOLOGY OF THE PLAICE WITH SPECIAL REGARD TO THE DANISH PLAICE-FISHERY. I. (CONTAINING 12 PLATES)

KØBENHAVN
I KOMMISSION HOS C. A. REITZEL
BIANCO LUNOS BOGTRYKKERI
1905

MEDDELELSER FRA KOMMISSIONEN FOR HAVUNDERSØGELSER
SERIE: FISKERI · BIND I · NR. 2 · 1905

CONTRIBUTIONS

TO

THE BIOLOGY OF THE PLAICE

WITH SPECIAL REGARD TO THE DANISH PLAICE-FISHERY

(CONTAINING 12 PLATES)

I

BY

A. C. JOHANSEN

KØBENHAVN
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1905

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General Remarks.

Among the aims, which the chairman of "Kommissionen for Havundersøgelser" Dr. C. G. Joh. Petersen has placed before the S. S. "Thor" during its cruises in the North Sea, the Skagerak and the Kattegat in the spring and autumn of 1903 and in the spring of 1904, a thorough investigation of the stock of plaice with special regard to the state of the plaice fishery has been set forth as the most urgent one. That an investigation of this kind should be required from Denmark is essentially due to the fact, that in spite of a very considerable increase in the catching power of the Danish fishing-vessels during the last decennium the average catch per year for each Kutter[1]) has on the whole been diminishing, while the entire yield of the plaice-fishery in the Skagerak, the Kattegat and the Belt-sea has kept about the same niveau.

The Report presented here forms the first part of a treatise intending to throw light upon such features of the Biology of the plaice, as may be supposed to be of importance in dealing with the problem: How to increase the stock of plaice.

I. Distribution of the bottom stages of Plaice in the Kattegat, the Skagerak and the eastern part of the North Sea.

As is well known the very young stages of the plaice, which have just assumed the form of the adult, are generally restricted to the margin of the beach, and as they increase in size they go further out into deeper water. In shallow water we get generally a number of small unmarketable fish in the trawl, besides comparatively few marketable ones. In deeper water we get only the last group. There is often a very great distance between the beach, where the small young ones appear, and the region, where the plaice spawn. At Esbjerg, for instance, we get numerous small young ones on the beach, but in the entire area north and south of Horn Reef between 55° and 56° N. lat., and at depths from 0—30 m. we can hardly get a mature plaice. The stock of small plaice on the beaches of the inshore waters at Esbjerg descend evidently from plaice spawning far away and mainly in depths of more than 30 m. in the North Sea.

The accompanying charts on Pl. I to V show the distribution according to size and number of plaice. At each station is stated the number of plaice of a certain size, caught by 50 f. Ottertrawl and

[1]) Kutter: Danish name of fishing vessels of a size of ca. 10—60 tons. They are sailing vessels provided with a motor, and they use for the plaice-fishery a sort of seine, the "Snurrevaad", not a trawl. These vessels catch the main part of the plaice landed in Denmark.

calculated by the rate of 1 hour's catch. This method of representation has, I believe, originally been suggested by Dr. C. G. Joh. Petersen.

The trawlings were carried on during the months: February, March, April, September, October, November, 1903, and February and March, 1904, consequently mainly in spring and autumn. An extra cod-end has usually been employed to catch small fish. What has been captured in this is included in the statements on the charts. (About trawlings see "Fishing results of the Danish steamer "Thor" in the Kattegat, the Skagerak and the North Sea". I.)

Plate I shows the distribution of plaice between 4—9 cm. The age of such plaice is assumed to be from ca. 6 months to a year (0-group see p. 7 ff.). In the localities marked with × plaice of the 0-group have been found by the shore investigations of the "Thor" in 1903 or 1904 and of the Danish Biological Station in preceeding years. The chart shows, that plaice of less than 10 cm. almost entirely keep inside the 20 metres line.

Plaice of a length from 4—9 cm. have only been caught by the trawl in considerable numbers off the west-coast of Jutland S. of N. lat. 56°0.

Plate II shows the distribution of plaice of a length from 10—14 cm. We may suppose the age of most of these plaice at Horn Reef to be ca. 18 months up to two years. (See p. 7 ff.). It will be seen, that the 20 metres line forms the outer boundary of the distribution of this group.

Plate III illustrates the distribution of plaice from 15—19 cm. The great abundance of such plaice is conspicuous in the Horn Reef area. It will be seen, that these plaice migrate considerably further out from the shore, than the two preceeding groups, still they are almost entirely restricted to the area inside the 40 metres line.

Plate IV shows the distribution of plaice exceeding 20 cm. or such, that on the whole may be considered of economical value. It appears, that the areas, where plaice of this kind are caught in greatest numbers, are:

1. Horn Reef Area.
2. Aalbæk Bay.
3. N. of Læsø.

The distribution of plaice, which have surpassed the minimum size for marketable fish in Denmark, viz ca. 26 cm., is represented on

Plate V. It will be noted, that plaice of this size also appear with the greatest frequency in the Horn Reef area.

Inside the dotted line off the west-coast of Jutland the Danish plaice fishery is supposed to be more considerable than that of the foreign nations. Outside this line the English trawl-fishery is predominating. The line has been drawn up according to the places of capture of the Danish marked plaice. (See Pl. X—XII.)

The charts I—V make it evident, that the area off the west-coast of Jutland S. of N. lat. 56°0 and at depths from 0—40 metres, is an important nursery of plaice for the deeper water in the North Sea. Another important source of the supply of plaice to the fishing-grounds in the northern Kattegat we evidently find in the Aalbæk Bay.

In comparison with the number of marketable plaice caught per hour by the "Thor", which is represented on Pl. V, is stated below, how many plaice the Danish Kutters have been able to catch on the different fishing grounds in 1902. One haul with the Snurrevaad on an average takes 1 hour. The table, which is an extract of the Kutters' journals, shows, when compared with Pl. V, that the Kutters on an average catch 4 à 8 times as many marketable fish as the "Thor" during the same time and even in the places, where she has found the best fishing grounds for plaice.

Locality		Number of hauls from the Kutters forming the basis of the calculation	Average number of marketable plaice per haul (ɔ: plaice above 25,6 cm.)
Kattegat.	Around Anholt	452	62
»	Aalborg-Bay	82	162
»	N. of Læsø	184	146
»	Herthas Flak	280	94
Skagerak.	Off Skagen	46	127
»	Off Tversted	97	119
»	Off Rubjerg-Løkken	213	108
»	Off Svinkleven-Bulbjerg	136	108
»	Off Hanstholm	72	186
North Sea.	Nymindegab-Blaavandpoint	88	418
»	Around Horn Reef	111	596

II. Rate of Growth of Plaice according to Dr. Petersen's Method.

Since Dr. JOH. PETERSEN in 1890 made the observation, that an assortment into groups took place, when he measured a great number of fishes of different species[1]), the method of measurement has been used on a large scale to obtain knowledge as to the growth and age of fishes. In spite of this it has not yet been ascertained, to what extent the method has led to reliable and conclusive results, not even with regard to the most common and from an economical point of view most important species.

We will here for a moment regard some of the difficulties we have to deal with, when we attempt to use Dr. PETERSEN's method.

I. By each of the gears employed an assortment of the fish takes place with regard to their size. There are certain size-groups, which are caught in preference to other size-groups.

If we employ two different gears A. and B. to catch a certain species in a particular locality, we may for instance obtain the following result:

	A.	B.
cm.	No. of specimens	No. of specimens
1	0	0
2	0	5
3	2	32
4	7	87
5	19	44
6	37	11
7	15	1
8	3	..
9	1	..
10	..	..

From this result, however, we dare not conclude, that the gears have brought up two different annual groups of fish, one group where the average size of the individuals is about 6 cm., and another group with an average size of ca. 4 cm. The difference in size may very well be due to the different gears.

II. The growth of the fishes can be very different in the different localities. (See f. inst. the results of "Thor"s marking Experiments.) If we let A. and B. in the above example denote two different localities, while the gear employed is the same, we dare not conclude either, that we have two

[1]) See „Beretning fra den danske Biologiske Station" I 1891.

different annual groups to deal with. The different size may here be a consequence of the fact, that the outer conditions have been unequally favourable during the growth of the individuals in the two localities.

III. The individuals of one particular annual group may be so predominant in number compared with individuals of other groups, that only one single maximum appears, even in the case of young individuals. This is an extremely common phenomenon.

Example.

The size of plaice at St. 75, S. of Horn Reef, was as follows (see Thor's Fishing results I):

cm.	♀	♂	cm.	♀	♂
15	2	5	25	21	15
16	38	54	26	24	14
17	160	268	27	13	4
18	**277**	**361**	28	4	6
19	200	231	29	5	3
20	154	131	30	2	1
21	97	71	31	..	..
22	47	42	32	..	..
23	29	20	33	1	..
24	28	18	34	.. ..	1

We are not here entitled to assume, that the specimens of a length of ca. 30 cm. are of the same age as those of ca. 15 cm. (See p. 8 ff.)

IV. If in a certain locality the presence of two or several size-groups of a species, only spawning once a year, is ascertained, we cannot be sure, that the difference in age between two successive groups is just that of one year; there is a possibility:

a) that the difference between two groups may be of two or several years. The interjacent series may have migrated into another locality, or some years may have been unfavourable for development.

b) that there is but a slight difference in age between the groups. The individuals may have been developped at different times during periodically favourable conditions within the same spawning period.

c) that there is no difference whatever. The individuals may formerly have lived in unequally favourable localities and now have assembled in the same place.

Examples of a.

During the voyage of the Danish steamer "Diana" to the East-coast of Iceland in the year 1899 HØRRING measured on June 20. a number of plaice caught in two hauls by "Snurrevaad" at a depth of 13—30 fms. in Vopnafjord. The results of his measurements are put down in Danish inches, each dot indicating one specimen. (See p. 5. 1 Danish inch = ca. 2·6 cm.)

The two groups appearing here are from a mathematical point of view very well separated, but considering the knowledge we possess from other places, regarding the growth of the plaice, the difference in age must be more than one year. We have not heard, that plaice anywhere should be able to grow about 12 inches a year. Even if we suppose, that the group of the larger individuals solely consists of females, and more than the half of the smaller ones of males, we cannot dismiss the view, that one or several series of grown up plaice have been very slightly represented in the hauls.

During the "Thor's" investigations around the Horn Reef appeared on St. 38—39 and on St. 41 the size-groups of plaice represented on pag. 8. The difference in size between two successive groups is for the males ca. 10 cm. on St. 38—39 and ca. 14 cm. on St. 41. According to our knowledge of the growth of plaice at the Horn Reef, which we have acquired partly by measurement and partly by the marking experiments, (see p. 8 and p. 22 ff.) it is to be supposed, that the difference in size here between the two series corresponds with a difference in age of at least 2 years, and that the interjacent annual series has either been wanting or very sparingly represented.

Inches	First haul	Second haul	Both hauls
8	.	8	8 .
8½		8½ ...	8½ ...
9	....	9	9 .....
9½	.....	9½	9½ .....
10	.....	10	10 .....
10½	.....	10½	10½ .....
11	.....	11	11 .....
11½	.....	11½	11½ .....
12	.....	12	12 .....
12½	.....	12½	12½ .....
13	.....	13	13 .....
13½	.....	13½	13½ .....
14	.....	14	14 .....
14½	.....	14½	14½ .....
15	.....	15	15 .....
15½	.....	15½	15½ .....
16	.....	16	16 .....
16½	..	16½	16½ .....
17	.....	17	17 .....
17½	.....	17½	17½ .....
18	...	18 ...	18 .....
18½	....	18½	18½ .....
19	..	19 ...	19 .....
19½	.....	19½ ..	19½ .....
20	...	20 ..	20 .....
20½	...	20½	20½ .....
21	.....	21 ..	21 .....
21½	.....	21½ ..	21½ .....
22	.....	22	22 .....
22½	.....	22½	22½ .....
23	.....	23	23 .....
23½	.....	23½	23½ .....
24	.....	24	24 .....
24½	.....	24½	24½ .....
25	.....	25	25 .....
25½	.....	25½	25½ .....
26	.....	26	26 .....
26½	.....	26½	26½ .....
27	.....	27	27 .....
27½	..	27½ .	27½ ...
28	...	28 ...	28 .....
28½	..	28½ ..	28½ ....
29	.	29 .	29 ..
29½		29½	29½
30	.	30	30 .

A supposed example of b. or c. has previously been set forth by the author in the Danish "Fiskeri Beretning" for 1901—1902. At the Vestmannaeyjar, HØRRING caught in one haul with the young fish seine the two well pronounced size-groups of small plaice represented below, one group of an average size of ca. 28 mm., another of ca. 44 mm. Hørring however supposed this small difference in size of ca. 16 mm. to indicate a difference in age of one year. Having noticed how inconsiderable the growth of the plaice may be during its second year on the Danish beaches (see p. 7) I am now inclined to believe that Hørring was right in his supposition. In addition to this Dr. JOHS. SCHMIDT, after a careful investigation of the growth of the Icelandic plaice, has informed me, that he is of the same opinion as Mr. HØRRING.

mm. Heymaey, Vestmannaeyjar. July 22. 1901. 0—4 m.
1 haul with young fish seine. 606 Plaice.

18
19
20 .
21 .
22 ....
23 .....
24 .....
25 .....
26 .....
27 .....
28 .....
29 .....
30 .....
31 .....
32 .....
33 .....
34 .....
35 .....
36 ....
37 ...
38 .....
39 ...
40 .....
41 .....
42 .....
43 .....
44 .....
45 .....
46 .....
47 .....
48 .....
49 ..
50 ..
51 ...
52
53 .
54

V. Size-groups will frequently appear, which are due to a mere chance and a consequence of an insufficient number of individuals. In many cases we must for this reason feel on unsafe ground, if we are unable to decide if the different groups from a mathematical point of view are well separated or not.

VI. It is often very difficult to be fairly sure, that the smallest annual series brought forth, really is the youngest existing.

VII. The older annual series of most species grow probably so slowly, that they all coalesce into one single size group. The measuring method is consequently not applicable to such older generations.

The here mentioned circumstances show, that the method of measurement must be used with care and discretion, and that we must be extremely cautious in attributing any importance to isolated results. That the method of measurement often may lead to good and clear results, when applied to young fish, is beyond doubt. To what degree the method may be applicable to the older generations will require further investigations and comparisons with results acquired by other means.

What standard of measurement, we shall employ, is also a question demanding some consideration. This will essentially depend on the accuracy with which we are able to measure. If two investigators measure a full-grown live cod, their results will generally show a difference of more than 1 cm. In this case we are not interested in getting their results in mm. If they measure a young plaice, the difference will hardly exceed 1 mm.

Experience has shown, that in dealing with young fish, e. g. the plaice, it may sometimes be practical to employ a smaller standard than cm. e. g. half cm. or mm. (See the above example from the Vestmannaeyjar.) In the tables below the standard has always been cm. and all fractions in excess of the whole number of cm. have been neglected (e. g. 16·9 = 16).

Rate of growth of plaice on the beach at Esbjerg (the North Sea).

A table of the size of plaice at the beach of Esbjerg in 1903 is represented below.

Station	42	42	88	
Place	Beach at Esbjerg	Beach at Esbjerg	Beach at Esbjerg	
Depth	0—1 m.	0—1 m.	0—1 m.	
Gear	Push-net	Eel-seine	Eel-seine	
Date	April 14. 1903	April 14. 1903	Octbr. 5. 1903	
Sex	♂ + ♀	♂ + ♀	♂	♀
1 cm.	ca. **150** (0-Group)			
2 »				
3 »				
4 »	.....	1		
5 »	1	5		
6 »	3 I-Group	24 I-Group	2	
7 »	**2**	**32**	28 0-Group	11
8 »	1	22	**102**	45 I-Group 0-Group
9 »	2	**33** II-Group?	74	**55**
10 »	.....	12	32	25
11 »	.....	8	**68** I-Group	**83**
12 »	1	11	41	69
13 »	.....	12	40	28
14 »	.....	10	14	15
15 »	.....	14	11	18
16 »	.....	12	11	9
17 »	.....	14	14	10
18 »	.....	4	6	2
19 »	.....	1	2	1
20 »	.....	2		
21 »	.....	2	1	
22 »	.....	1		
23 »	.....	1		
24 »	.....	.....		
Total number	ca. 160	221	446	371

On the St. 88 the Push-net was also employed, but no individuals of a smaller size than 6 cm. were captured.

It is evident from the summary above, that the growth of the plaice in the first summer is comparatively considerable at Esbjerg, the individuals of the 0-group having about autumn reached an average size of ca. 7 cm. the smallest individuals one of ca 6 mm. A similar rapidity of growth of the 0-group was found at Scotland by Dannevig (17th Scott. Fishery Report. 1898) and Fulton (20th Scott. Fishery Report. 1902).

At Esbjerg the individuals of the I-group are in spring of the same size as the individuals of the 0-group in autumn or rather a little less. This is in accordance with the fact pointed out by Fulton and others, (l. c. 1902), that the growth of the young plaice living on the beaches is quite arrested in winter. During the next summer the increase in growth is much less at Esbjerg, being only of ca. 2—3 cm. (I suppose here, that the difference in age between the successive groups is that of one year, and that we have not before us any of the circumstances set forth under IV. b and c. p. 4).

Rate of growth of plaice on the area around the Horn Reef.

On the Horn Reef area the "Thor" has taken a series of hauls from which two or more size-groups have been brought forth. The result of measurement on the stations, where these annual groups are most conspicuous, is stated in the summary below and on the adjoined Plates VI—IX. (Tr. = Trawl. C. = the extra Cod-end).

Station	38—39		41		80		81		82		195		192 a, b, c, d	
Area	S. of Vyl		N. of Tuxen		Nymindegab		Kærgaarde		Slugen N.		Kærgaarde		S.W. of Blaavand	
Depth	19—21 m.		11—13 m.		9—13 m.		13—15 m.		19—21 m.		15 m.		14 m.	
Date	10. IV		11. IV		28. IX		28. IX		19. IX		24. II		23 II	
Year	1903		1903		1903		1903		1903		1904		1904	
Gear	Tr. + C.		Tr. + C.		Tr. + C.		Tr. + C.		Tr. + C.		Tr.	C.	Tr.	C.
Sex	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀ + ♂	♀ + ♂	♀ + ♂	♀ + ♂
1 cm.														
2 »														
3 »														
4 »														
5 »	...	...	...	...	6	1	...	...	...	...	...	...	..	1
6 »	...	...	...	...	111	113	10	10	10	10	...	3	...	3
7 »	...	1	...	...	**211**	**174**	**17**	**9**	**49**	**48**	1	8	10	**28**
8 »	...	...	1	...	67	39	7	5	6	4	1	7	**14**	20
9 »	1	1	1	2	12	10	1	...	...	...	3	0	6	17
10 »	1	...	...	2	2	2	...	...	...	1	3	1	11	8
11 »	3	14	3	3	4	4	2	...	3	1	3	3	22	12
12 »	9	27	2	3	8	13	7	9	15	**13**	5	...	**22**	5
13 »	22	**59**	9	24	36	32	56	58	**27**	8	**7**	...	**31**	7
14 »	**27**	55	**15**	**24**	**56**	**58**	**153**	**118**	14	12	5	...	10	3
15 »	20	33	12	18	53	45	141	108	50	28	4	...	27	2
16 »	22	32	12	14	61	39	100	64	76	**68**	4	...	54	6
17	29	27	11	14	89	70	110	70	**82**	51	1		119	2
18 »	10	21	13	7	**107**	**75**	179	116	53	25	3	...	198	2
19 »	9	17	7	5	89	70	**204**	**122**	30	13	3	...	**246**	2
20 »	17	19	2	1	73	40	176	100	24	9	3	...	**234**	0
21 »	20	39	3	3	63	27	151	78	16	2	**5**	...	186	1
22 »	30	47	4	9	37	10	101	41	12	1	5	...	132	1
23 »	30	60	5	11	23	9	61	23	7	3	1	...	101	
24 »	29	**62**	17	19	10	...	37	18	9	1	3	...	77	
25 »	**35**	**62**	18	27	2	2	16	18	4	...	4	...	66	
26 »	**36**	36	30	30	1	...	12	4	2	1	3	...	51	
27 »	18	30	21	**38**	...	...	7	...	3	1	**7**	...	26	
28 »	21	13	**37**	**39**	1	...	7	...	3	...	**9**	...	12	
29 »	7	8	31	29	...	...	4	...	1	2	2	...	1	
30 »	1	3	19	16	1	...	2	...	...	...	3			
31 »	1	...	9	4	...	...	...	...	...	...	2			
32 »	4	1	10	3	...	...	1							
33 »	3	...	2	1										
34 »	...	...	2	1										
35 »														
36														
37 »														
38														
39			1											
40														
Total No.	414	667	296	347	1123	833	1562	971	496	302	90	22	1656	120

$3\frac{1}{2}$—4 years old | $2\frac{1}{2}$—3 years old | $1\frac{1}{2}$—2 years old | $\frac{1}{2}$—1 year old

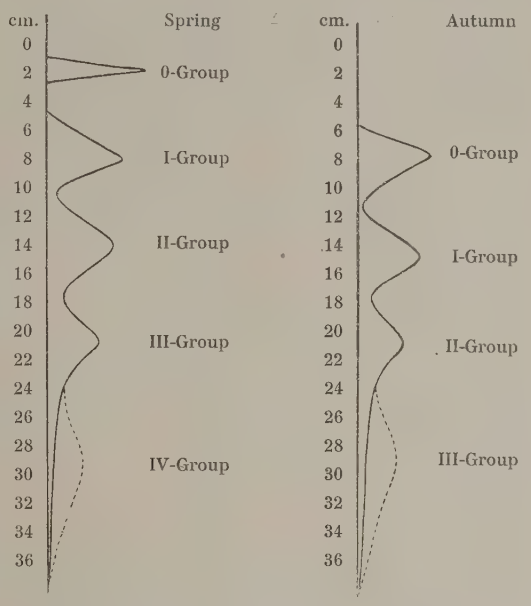
On the stations 80, 81 and 82, from September 1903, 3 different size-groups appear in beautiful accordance. The smallest group must be supposed to be the 0-group, as no plaice of less size were found on the beach during this season. (See p. 7).

While the increase in growth of the plaice during the second year did not surpass 2—3 cm. on the beach at Esbjerg, it is considerably greater here, namely 5—7 cm.

At St. 192 from February of 1904 (see p. 8) the individuals are grouped in a similar way as on the three stations mentioned above. The mean size is for the first group ca. 7—8 cm.; for the second ca. 12, and for the third ca. 20 cm.

The results, we have obtained at the above-named stations at Horns Reef concerning the three youngest annual series, are presumably conclusive. Less reliable however is the result for the fourth series in the autumn and winter. At St. 195 from February of 1904 there are certainly four fairly well separated groups, but the number of specimens is not so considerable that we dare rely with certainty upon the result. It will be seen, that the mean size of the specimens of the fourth group is about 28 cm. At the St. 38—39 and 41 the mean of the oldest group is for the males respectively ca. 24 and ca. 27 cm. and for the females ca. 26 and ca. 28 cm. This group might seem to be the IV-group.

If we summarise the result concerning the growth of plaice on the Horn Reef area the following appear. During the first year the plaice reach an average size of ca. 7—8 cm. During the second year the mean increase is ca. 6 cm. and during the third year 4—8 cm. The increase in growth during the fourth year we have not been able to settle with certainty. It might seem to be 5 à 8 cm. In the sequel it will be shown to what degree the result set forth here is in accordance with the results of the marking experiments.



Diagrams showing the size-groups of plaice on the area around the Horn Reef. The oldest group was very conspicuous in the spring of 1903, but did not appear in the autumn of 1903.

For several other trawling stations than those on the Horn Reef area, we have tried to elucidate the annual series by means of measurements, but the results have not been conclusive anywhere else. A list of measurements of plaice at "Thor's" trawling stations is given in "Fishing results of the Danish steamer Thor etc. I". which may be referred to.

In my opinion the method of measurement has been applicable nowhere in the Danish seas to plaice all exceeding 25 cm. The results of measurement of such plaice show not more than one pronounced maximum of individuals.

III. Results of Marking Experiments from the "Thor" in 1903.

In April of 1903, 1220 marked plaice were liberated from the "Thor", 1000 in the North Sea, in the Horn Reef area, 21 off Nissum Fjord (the North Sea), 78 in the area off Hanstholm-Torup (the North Sea) 58 in Jammer Bay (the Skagerak), and 63 in the area off Skagen-Hirshals (the Skagerak).

When liberated, the total length of the marked plaice was between 12 and 42 cm., the length of the majority between 20—30 cm. Nearly all the fish were immature at liberation.

Dr. PETERSEN's marking method was used. The plaice were marked with two bone buttons and a brass disc, fixed with a piece of silver wire on the dorsal edge of the body, between two of the interspinous bones.

A survey of the marking experiments is offered in the tables below. Table A. contains some particulars of the liberation and a chronological record of the plaice recaptured up to the end of June, 1904, the records of the different experiments being kept distinct from one another. In Table B. is represented a survey of the size of the plaice at the time of liberation together with a statement of those of the liberated fish, that have been recovered.

Table A.

Particulars of Liberation. Date. No. of Fish. Locality etc.	Particulars of Recovery							
	Date	No. on Label	Sex	Locality	Central Position (Approximately)	Fishing Vessel	No. of months between Liberation and Recovery	Initial Size	Ultimate Size
1903. April 10. 12 Plaice (No. 1—12). 7 miles WSW of Nymindegab. 9 fms. 55°46′ N 8°0′ E "Thor" St. 36. Experiment N. I	1904 April 14	2	♀	3 miles E of Cancer. 4½ fms.	55°29′ N 8°06′ E	Danish Kutter	XII	22	27,5
	» May 3	10	♂	Off Fanø. 7 miles distant		German S. S.	XIII	13,5	
1903. April 10. 255 Plaice (No. 13—267). 6 miles SE by E of Vyl Lightship. 9 fms. 55°22′ N 7°55′ E. "Thor" St. 38. Experiment No. II	1903 April 11	242	♂	Lat. 55°10′ N Long 7°50′ E	55°10′ N 7°50′ E	English S. S.	0	17	
	» » 13	118	♂	Lat. 55°20′ N Long. 7°50′ E	55°20′ N 7°50′ E	» »	0	24·5	
	» » 14	69	♀	2½ miles ENE of Vyl Lightship	55°25′ N 7°48′ E	» »	0	16	15
	» » 14	91	♀	5 miles SSE of Vyl Lightship	55°20′ N 7°51′ E	» »	0	25·5	
	» » 14	220	♂	5 miles NNE of Vyl Lightship	55°29′ N 7°46′ E	» »	0	20	
	» » 17	28	♂	10 miles SSE of Vyl Lightship	55°14′ N 7°51′ E	» »	0	25·5	
	» » 20	79	♂	1 mile N of Blaavand. 3 fms.	55°35′ N 8°06′ E	Danish Kutter	0	24	25
	» » 24	168	♂	4 miles E of Vyl Lightship. 10 fms.	55°24′ N 7°52′ E	» »	0	27·5	27·5
	» » 25	101	♂	Off Fanø		German S. S.	0	25·5	23·5
	» » 29	232	♂	8 miles SW of Graadeep. 9 fms.	55°19′ N 8°07′ E	Danish Kutter	0	16·5	16·5
	» » 30	76	♂	7 miles W of Graadeep. 8 fms.	55°23′ N 8°4′ E	» »	0	22	21·5
	» May 1	97	♀	1 mile W of Ringebjerge Bn. 5 fms.	55°37′ N 8°5′ E	» »	I	29	28·5
	» » 1	98	♀	4 miles WSW of Graadeep	55°24′ N 8°10′ E	» »	I	23	22·5
	» » 1	120	♀	North Sea		» »	I	24·5	24·5
	» » 5	142	♂	2 miles NW by W of Slugen. 13 fms.	55°34′ N 7°49′ E	» »	I	25	25
	» » 5	150	♂	1 mile NW of the Munk buoy. 8 fms.	55°32′ N 7°51, E	» »	I	26·5	26
	» » 5	188	♂	4 miles W of Kærgaarde Bn. 7 fms.	55°41′ N 8°3′ E	» »	I	26	25·5
	» » 7	43	♂	1 miles W of Kærgaarde Bn. 4½ fms.	55°41′ N 8°9′ E	» »	I	26	26
	» » 10	19	♀	7 miles S of Vyl Lightship. 12 fms.	55°16′ N 7°46′ E	» »	I	27	26
	» » 10	192	♂	3 miles W of Vyl Lightship. 10 fms.	55°23′ N 7°40′ E	» »	I	25	24
	» » 12	39	♂	8 miles SW of Graadeep bell buoy. 8 fms.	55°18′ N 8°10′ E	» »	I	26·5	26·5
	» » 14	26	♂	Lat. 55°50′ N Long. 7°52′ E	55°50′ N 7°52′ E	English S. S.	I	27	27
	» » 16	203	♂	Lat. 55°0′ Long. about 8°0′. 8 fms.	55°0′ N 8°0′ E	» »	I	21·5	20·5
	» » 19	111	♂	Off Lister in Lat. 55°12′ N. 10 fms.	55°12· N 7°55′ E	» »	I	24·5	25·5
	» » 22	27	♂	1½ miles WNW of Slugen. 9½ fms.	55°33′ N 7°55′ E	Danish Kutter	I	26·5	26
	» » 22	102	♂	1 mile NW of Slugen. 13 fms.	55°33′ N 7°50′ E	» »	I	27·5	28
	» » 23	20	♀	2 miles NNW of Kærgaarde Bn. 8 fms.	55°43′ N 8°8′ E	» »	I	28·5	27·5
	» » 25	32	♀	18 miles SW by W of Graadeep. 12 fms.	55°21′ N 7°51′ E	» »	I	23·5	23
	» » 27	23	♂	4 miles W of Cancer. 8 fms.	55°29′ N 7°55′ E	» »	I	25	24·5
	» » 27	134	♀	4 miles S of Vyl Lightship. 12 fms.	55°20′ N 7°48′ E	» »	I	25 5	25
	» » 28	193	♂	18 miles WSW of Graadeep. 11 fms.	55°15′ N 7°49′ E	» »	I	25	25
	» » 31	116	♂	6 miles SE of Vyl Lightship. 8½ fms.	55°21′ N 7°54′ E	» »	I	27	27·5
	» June 2	37	♀	6 miles from Horn Reef. 7 fms. Horn Point land bearing SE by E	55°38′ N 7°25′ E	English S. S.	II	26	26

Table A. Continued.

Particulars of Liberation. Date. No. of Fish. Locality etc.	Particulars of Recovery				
	Date	No. on Label	Sex	Locality	Central Position (Approximately)	Fishing Vessel	No of months between Liberation and Recovery	Initial Size	Ultimate Size
1903. April 10. 255 Plaice (No. 13—267). 6 miles SE by E of Vyl Lightship. 9 fms. 55°22′ N 7°55′ E. "Thor" St. 38. Experiment No. II	1903 June 2	189	♂	10 miles S of Vyl Lightship. 10 fms.	55°14′ N 7°50′ E	Danish Kutter	II	26	25·5
	» » 6	95	♀	1 mile W of Nymindegab	55°48′ N 8°9′ E	» »	II	22	
	» » 6	162	♂	2 miles W of Kærgaarde Bn. 7 fms.	55°41′ N 8°6′ E	» »	II	25	25
	» » 7	36	♀	10 miles NE of Horn Reef Lightship.	55°42′ N 7° 29 E	English S. S.	II	23·5	23·5
	» » 7	87	♂	11 miles NNE of Horn Reef Lightship	55°45′ N 7°22′ E	» »	II	23	23
	» » 8	153	♀	2 miles of Vyl Lightship	55°22′ N 7°46′ E	» »	II	25	25·5
	» » 10	99	♀	20 miles NW of Slugen N. 10 fms.	55°40′ N 7°23′ E	Danish Kutter	II	27	27·5
	» » 11	113	♀	6 miles SSE of Vyl Lightship. 10 fms.	55°18′ N 7°53′ E	» »	II	24·5	24
	» » 12	29	♀	3 miles SE of Vyl. 10½ fms.	55°21′ N 7°51′ E	» »	II	27	
	» » 16	181	♀	12 miles NE of Horn Reef Lightship. 11 fms.	55°41′ N 7°31′ E	» »	II	21	
	» » 28	154	♀	3 miles SE of Vyl Lightship. 11 fms.	55°22′ N 7°50′ E	» »	II	24	25
	» » 30	200	♂	12 miles ENE of Horn Reef Lightship	55°41′ N 7°37′ E	English S. S.	II	23	24·5
	» July 1	115	♀	Off southermost bouy of Horn Reef	55°26′ N 7°48′ E	» »	III	22·5	22
	» » 7	48	♀	Horn Reef 55°44′ N 7°55′ E	55°44′ N 7°55′ E	German S. S.	III	26·5	28
	» August 2	96	♀	25 miles NW of Horn Reef Lightship	55°46′ N 6°40′ E	English S. S.	IV	26·5	29
	» » 7	59	♂	Lat. 55°45′ Long. 6°45′. 19 fms.	55°45′ N 6°45′ E	» »	IV	22	22·5
	» » 7	155	♀	Lat. 55°11′ N Long. 7°8′ E	55°11′ N 7°8′ E	» »	IV	22·5	23·5
	» » 18	175	♂	15 miles NW of Horn Reef Lightship	55°42′ N 6°58′ E	Danish Kutter	IV	21	22
	» Nov. 24	58	♂	North Sea		English S. S.	VII	24·5	29
	» » 28	257	♂	Between Fanø and Esbjerg. Ca. 3 fms.	55°28′ N 8°25′ E	Dan. Fishingb.	VII	16·5	17
	» Dec. 13	229	♂	Lat. 55°11′ N Long. 6°16′ E. 26 fms.	55°11′ N 6°16′ E	English S. S.	VIII	21	24
	1904 March 3	204	♀	5 miles E by S of Vyl Lightship. 10 fms.	55°21′ N 7°37′ E	Danish Kutter	XI	18·5	20
	» » 23	173	♀	2 miles SSW of Vyl Lightship. 11 fms.	55°21′ N 7°45′ E	» »	XI	23	27
	» April 18	165	♂	15 miles WSW of Graadeep. 9 fms.	55°17′ N 7°54′ E	» »	XII	21·5	26·5
	» May 4	235	♀	Lat. 54°55′ N Long. 8°15′ E	54°55′ N 8°15′ E	English S. S.	XIII	17·5	19·5
	» » 14	208	♀	1 mile SW of Cancer. 7 fms.	55°29′ N 8°2′ E	Danish Kutter	XIII	19	23
	» » 29	227	♂	3 miles W of Cancer. 8 fms.	55°26′ N 7°56 E	» »	XIII	21	27
	» June 8	60	♀	7 miles W of Graadeep. 8 fms.	55°25′ N 8°4′ E	» »	XIV	20·5	22·5
	» » 15	126	♂	22 miles W by N of Red Cliff. 11 fms.	54°56′ N 7°43′ E	» »	XIV	23·5	27
	» » 18	90	♀	225 miles from Spurn. Lat. 56°10′ N Long. 5°25′ E	56°10′ N 5°25′ E	English S. S.	XIV	20	25·5
1903. April 10. 445 Plaice (No. 268—712). 4 miles SE of Vyl Lightship. 10—11 fms. 55°21′ N 7°52′ E. "Thor" St. 39. Experiment No. III	1903 April 11	300	♂	Lat. 55°10′ N Long. 7°50′ E	55°10′ N 7°50′ E	English S. S.	0	23·5	23
	» » 11	343	♂	4 miles SE of Vyl Lightship	55°21′ N 7°51′ E	Danish Kutter	0	26·5	26·5
	» » 11	369	♀	4 miles SE of Vyl Lightship	55°22′ N 7°51′ E	» »	0	26	25
	» » 14	436	♀	7 miles SE of Vyl Lightship	55°20′ N 7°56′ E	English S. S.	0	23	
	» » 15	328	♂	North Sea		» »	0	23	
	» » 15	449	♂	Lat. 55°20′ N. Vyl Lightship bearing NE 2 miles off	55°20′ N 7°43′ E	» »	0	28	28
	» » 15	458	♂	Lat. 55°16′ N Long. 7°50′ E	55°16′ N 7°50′ E	» »	0	22·5	21
	» » 15	576	♀	4 miles SE of Vyl Lightship	55°21′ N 7°52′ E	» »	0	24	
	» » 17	472	♂	8 miles SW of Vyl Lightship. 11½ fms.	55°17′ N 7°38′ E	» »	0	22	22
	» » 20	301	♂	North Sea		German S. S.	0	28·5	28
	» » 21	349	♂	7 miles SE of Vyl Lightship	55°20′ N 7°55′ E	English S. S.	0	24·5	
	» » 21	368	♂	15 miles SSW of Vyl Lightship	55°9′ N 7°41′ E	» »	0	26·5	25·5
	» » 24	477	♂	1 mile SE of Vyl Lightship. 11 fms.	55°23′ N 7°46′ E	Danish Kutter	0	24·5	24
	» » 24	542	♀	6 miles N by W of Vyl Lightship. 10 fms.	55°29′ N 7°41′ E	» »	0	28·5	28
	» » 24	565	♂	4 miles SE of Vyl Lightship. 11 fms.	55°21′ N 7°51′ E	» »	0	24·5	24
	» » 24	618	♀	6 miles SE of Vyl Lightship. 10 fms.	55°20′ N 7°54′ E	» »	0	27·5	27
	» » 24	643	♂	4 miles SE of Vyl Lightship. 11 fms.	55°21′ N 7°51′ E	» »	0	23	22
	» » 25	650	♂	SW of Graadeep		German S. S.	0	23	23·5
	» » 27	289	♀	3 miles NW of Slugen. 10 fms.	55°35′ N 7°46′ E	Danish Kutter	0	33	31·5
	» » 27	315	♂	WSW of Graadeep. 10 fms.		German S. S.	0	27	
	» » 27	332	♂	4 miles W of Cancer. 8 fms.	55°28′ N 7°55′ E	Danish Kutter	0	26	26
	» » 27	659	♀	6 miles W of Graadeep. 7½ fms.	55°24′ N 8°5′ E	» »	0	26·5	26
	» » 27	445	♀	4 miles W of Graadeep. 8 fms.	55°25′ N 8°8′ E	» »	0	27	27
	» » 27	478	♂	6 miles SSW of Graadeep. 8 fms.	55°20′ N 8°13′ E	» »	0	22	21
	» » 27	580	♂	4 miles W of Graadeep. 8 fms.	55°25′ N 8°8′ E	» »	0	23·5	23·5

Table A. Continued.

Particulars of Liberation. Date. No. of Fish. Locality etc.	Particulars of Recovery									
	Date	No. on Label	Sex	Locality	Central Position (Approximately)	Fishing vessel	No of months between Liberation and Recovery	Initial Size	Ultimate Size
1903. April 10. 445 Plaice (No. 268-712). 4 miles SE of Vyl Lightship. 10—11 fms. 55°21′ N 7°52′ E. "Thor" St. 39. Experiment No. III	1903 April 27	593	♀	3 miles SE of Vyl Lightship. 9 fms.	55°22′ N 7°49′ E	Danish Kutter	0	27·5	26·5
	» » 27	603	♀	2 miles S of Cancer. 8 fms.	55°27′ N 8°3′ E	» »	0	23	22·5
	» » 28	319	♀	8 miles W of Graadeep. 8 fms.	55°24′ N 8°1′ E	» »	0	26	26
	» » 28	428	♀	8 miles W of Graadeep. 8 fms.	55°24′ N 8°1′ E	» »	0	27	26·5
	» » 28	462	♀	8 miles WSW of Vyl Lightship	55°19′ N 7·34′ E	» »	0	26·5	
	» » 28	465	♀	4 miles W by N of Graadeep	55°26′ N 8°8′ E	» »	0	23	22
	» » 28	535	♂	6 miles W by S of Graadeep. 8½ fms.	55°23′ N 8°5′ E	» »	0	28	27·5
	» » 28	538	♂	4 miles W of Graadeep. 7 fms.	55°25′ N 8°8′ E	» »	0	25	25
	» » 28	563	♀	5 miles SW by W of Graadeep. 8 fms.	55°22′ N 8°9′ E	» »	0	29·5	28·5
	» » 28	601	♀	4 miles SW by W of Graadeep. 7 fms.	55°23′ N 8°10′ E	» »	0	26·5	26
	» » 28	640	♂	5 miles SW by W of Graadeep. 8 fms.	55°22′ N 8°9′ E	» »	0	24·5	23·5
	» » 28	644	♂	6 miles W by S of Graadeep. 8½ fms.	55°23′ N 8°5′ E	» »	0	26	25·5
	» » 29	284	♂	6 miles W of Graadeep. 7½ fms.	55°24′ N 8°5′ E	» »	0	29	29
	» » 29	443	♂	6 miles W of Graadeep. 7½ fms.	55°25′ N 8°5′ E	» »	0	28·5	28
	» » 29	534	♀	8 miles WSW of Graadeep. 7 fms.	55°21′ N 8°4′ E	» »	0	32	31·5
	» » 29	588	♀	1 mile S of Vyl Lightship. 10 fms.	55°22′ N 7°46′ E	» »	0	28	27·5
	» » 30	583	♂	6 miles WSW of the bell-buoy. Graadeep 8 fms.	55°23′ N 8°5′ E	» »	0	29·5	29
	» » 30	652	♂	3 miles WSW of Graadeep. 8 fms.	55°24′ N 8°11′ E	» »	0	28·5	28·5
	» » 30	709	♀	4 miles W of the bell-buoy. Graadeep 8 fms.	55°25′ N 8°7′ E	» »	0	26	26
	» May 1	274	♂	6 miles NW of Graadeep. 8 fms.	55°29′ N 8°6′ E	» »	I	29	28
	» » 1	279	♂	3 miles SW of Cancer. 7 fms.	55°27′ N 7°59′ E	» »	I	22	21
	» » 1	487	♂	6 miles NW of Graadeep. 8 fms.	55°29′ N 8°6′ E	» »	I	24	23·5
	» » 1	660	♂	3 miles SW of Cancer. 7 fms.	55°26′ N 7°55′ E	» »	I	26	26·5
	» » 2	338	♀	2 miles W by S of Cancer. 8 fms.	55°28′ N 7°58′ E	» »	I	29	29
	» » 2	397	♂	5 miles E by S of Vyl Lightship. 10 fms.	55°24′ N 7°53′ E	» »	I	27	26·5
	» » 2	556	♀	2 miles W by S of Cancer. 8 fms.	55°28′ N 8°0′ E	» »	I	25	25
	» » 2	560	♂	1 mile SW by W of Cancer. 6 fms.	55°29′ N 8°1′ E	» »	I	27·5	27
	» » 4	548	♀	4 miles SE of Vyl buoy. 9 fms.	55°25′ N 7°56′ E	» »	I	32	31
	» » 5	335	♂	4 miles NW of Ringebjerge Bn. 7 fms.	55°39′ N 8°1′ E	» »	I	26·5	26
	» » 7	280	♀	1 mile N of Slugen. 8 fms.	55°34′ N 7°51′ E	» »	I	26	26
	» 7	337	♂	Blaavand Point bearing SE by E distant 7 miles	55°38′ N 7°56′ E	English S. S.	I	27	
	» » 7	697	♀	1 mile W of Kærgaarde Bn. 4½ fms.	55°41′ N 8°7′ E	Danish Kutter	I	27	26·5
	» » 10	285	♂	Off Blaavand Point, inside the Horn Reef	55°33′ N 8°1′ E	» »	I	29·5	28
	» » 10	353	♀	5 miles N of Slugen. 9 fms.	55°38′ N 7°50′ E	» »	I	26·5	26·5
	» » 10	676	♂	2 miles SW of Kærgaarde Bn. 7 fms.	55°40′ N 8°6′ E	» »	I	27	27
	» » 11	272	♀	Off Nørre Nebel, Jutland		» »	I	28	28
	» » 11	559	♀	6 miles SW by S of Graadeep. 8 fms.	55°20′ N 8°11′ E	» »	I	24	23·5
	» » 11	594	♂	3½ miles SSW of Graadeep. 8 fms.	55°22′ N 8°14′ E	» »	I	24	23·5
	» » 11	606	♀	Graadeep		German S. S.	I	27·5	28
	» » 12	323	♀	North Sea		Danish Kutter	I	28·5	
	» » 12	404	♀	4 miles S of Slugen	55°29′ N 7°54′ E	» »	I	24·5	24
	» » 12	567	♀	4 miles SW of Knudedeep. 7½ fms.	55°15′ N 8°17′ E	» »	I	28	27·5
	» » 12	665	♀	North Sea		» »	I	24·5	
	» » 16	320	♂	Sylt Light bearing SSE distant 10 miles	55°5′ N 8°10′ E	English S. S.	I	27	
	» » 23	276	♀	3 miles NW of Slugen. 11 fms.	55°35′ N 7°48′ E	Danish Kutter	I	23	22
	» » 23	405	♀	3 miles NW of Slugen. 11 fms.	55°35′ N 7°48′ E	» »	I	28	29
	» » 23	544	♂	3 miles NW of Slugen. 11 fms.	55°35′ N 7°48′ E	» »	I	32	31·5
	» » 23	586	♀	2 miles WNW of Kærgaarde Bn. 7 fms.	55°42′ N 8°6′ E	» »	I	24	24
	» » 23	590	♂	3 miles WNW of Kærgaarde Bn. 7½ fms.	55°42′ N 8°4′ E	» »	I	27·5	28
	» » 24	290	♂	10 miles SW by W of Graadeep. 9 fms.	55°19′ N 8°2′ E	» »	I	25	25
	» » 24	654	♂	Off Skallingen	55°29′ N 8°10′ E	» »	I	24	23
	» » 27	286	♂	3 miles NW of Kærgaarde Bn. 7 fms.	55°43′ N 8°5′ E	» »	I	28	27·5
	» » 27	604	♂	2 miles SW of Vyl Lightship. 9 fms.	55°22′ N 7°43′ E	» »	I	24·5	25·5
	» » 28	433	♀	4 miles SW of Graadeep. 10 fms.		» »	I	25	24·5
	» » 31	371	♂	1 mile NW by W of Slugen N. 7 fms.	55°33′ N 7°50′ E	» »	I	25	

Table A. Continued.

Particulars of Liberation. Date. No. of Fish. Locality etc.	Particulars of Recovery								
	Date	No. on Label	Sex	Locality	Central Position (Approximately)	Fishing Vessel	No. of months between Liberation and Recovery	Initial Size	Ultimate Size
1903. April 10. 445 Plaice (No. 268—712). 4 miles SE of Vyl Lightship. 10—11 fms. 55°21′ N 7°52′ E. "Thor" St. 39. Experiment No. III	1903 May 31	423	♀	Near the Vyl Lightship	55°24′ N 7°45′ E	English S. S.	I	20·5	21
	» » 31	547	♂	16 miles NW by W of Red Cliff. 12 fms.	55°3′ N 7°53′ E	Danish Kutter	I	18	17
	» »	355	♀	2 miles from Vyl Lightship, bearing N to NE. 10 fms.	55°22′ N 7°45′ E	English S. S.	I	29	28·5
	» June 4	312	♂	4 miles S of Vyl Lightship. 12 fms.	55°20′ N 7°47′ E	Danish Kutter	II	26	26
	» » 8	520	♂	3 miles NW by W of Slugen N. 12½ fms.	55°34′ N 7°48′ E	» »	II	26	26
	» » 8	537	♂	Lat. 54°55′ N Long. 7°48′ E. 10 fms.	54°55′ N 7°48′ E	English S. S.	II	27	
	» » 10	447	♂	12 miles NW of Slugen. 13 fms.	55°40′ N 7 35′ E	Danish Kutter	II	25·5	26
	» » 11	383	♂	7 miles S by E of Vyl Lightship. 11 fms.	55°17′ N 7°51′ E	» »	II	22·5	23
	» » 12	334	♂	4 miles S of Vyl Lightship. 12 fms.	55°20′ N 7°47′ E	» »	II	24·5	
	» » 12	608	♂	2 miles SE of Vyl Lightship. 10 fms.	55°22′ N 7°48′ E	» »	II	24	
	» » 15	308	♀	6 miles WSW of Vyl Lightship. 14 fms.	55°20′ N 7°37′ E	» »	II	27	
	» » 18	674	♀	2 miles S of Vyl Lightship. 12 fms.	55°22′ N 7°46′ E	» »	II	25	
	» » 21	316	♂	Lat. 55°15′ N Long. 6°50′ E. 18 fms.	55°15′ N 6°50′ E	Belgian S. S.	II	26	27·5
	» » 22	435	♂	1 mile W of Nymindegab. 12 fms.	55°49′ N 8°8′ E	Danish Kutter	II	25·5	23·5
	» » 23	296	♀	Lat. 56°10′ N Long. 7°35′ E.	56°10′ N 7°35′ E	English S. S.	II	26·5	27
	» » 23	340	♀	20 miles NNE of Horn Reef Lightship. 11 fms.	55°53′ N 7°26′ E	» »	II	26	26
	» July 3	298	♂	8 miles N of Horn Reef Lightship. 12 fms.	55°42′ N 7°16′ E	Danish Kutter	III	25	25·5
	» » 7	541	♂	Lat. 56°15′ N Long. 5°58′ E	56°15′ N 5°58′ E	German S. S.	III	30	33
	» » 11	488	♀	Off Horn Reef. 18 fms.		English S. S.	III	24	
	» » 13	628	♀	15 miles NW of Horn Reef Lightship. 15 fms.	55°42′ N 6°57′ E	» »	III	28	
	» » 15	571	♀	North Sea		» »	III	28	
	» » 23	647	♂	62 miles SW by W of Graadeep. 22 fms.	54°42′ N 7 0′ E	Danish Kutter	III	25	
	» August 7	641	♂	Lat. 56°15′ N Long. 5°58′ E.	56°15′ N 5°58′ E	German S. S.	IV	24	
	» » 16	421	♂	20 miles NW of Horn Reef Lightship	55°46′ N 6°50′ E	Danish Kutter	IV	23	
	» » 17	584	♀	20 miles NW of Horn Reef Lightship	55°46′ N 6°50′ E	» »	IV	23	25·5
	» » 18	625	♂	212 miles E by N from Spurn	54°53′ N 5°38′ E	English S. S.	IV	26·5	27·5
	» » 27	531	♂	Lat. 56°16′ N Long. 7°0′ E. 23 fms.	56°16′ N 7°0′ E	» »	IV	26	29·5
	» October 8	269	♀	Lat. 55°33′ N Long 7°17′ E.	55°33′ N 7°17′ E	» »	IV	28	30
	» Nov. 28	638	♂	Between Jerrik and Skallingen	55°29′ N 8°22′ E	Dan. Fishingb.	VII	21	24
	1904 January 5	581	♂	Lat. 55°20′ N Long. 4°45′ E	55°20′ N 4°45′ E	English S. S.	IX	23	28
	» March 3	578	♂	2 miles W of Vyl Lightship. 11 fms.	55°23′ N 7°42′ E	Danish Kutter	XI	25·5	29·5
	» » 28	672	♀	16 miles SW by W of Graadeep. 11 fms.	55°14′ N 7°56′ E	» »	XI	23	27
	» April 21	708	♀	1 mile SE of Cancer. 6 fms.	55°29′ N 8°3′ E	» »	XII	20	21·5
	» » 27	519	♂	3 miles W by S of Cancer. 6½ fms.	55°28′ N 7°57′ E	» »	XII	24	27
	» » 29	389	♀	1 mile NW of Slugen N	55°33′ N 7°50′ E	» »	XII	24·5	29·5
	» May 28	679	♀	4 miles N of Knudedeep. 5 fms.	55°21′ N 8°19′ E	» »	XIII	21	24·5
	» » 29	327	♂	3 miles W of Cancer. 8 fms.	55°28′ N 7°56′ E	» »	XIII	25·5	29·5
	» June 2	399	♂	4 miles SW by S of "Fanø watering place". 3½ fms.	55°24′ N 8°18′ E	» »	XIV	24	
	» » 16	545	♀	4 miles W of Kærgaarde Bn. 8½ fms.	55°41′ N 8°2′ E	» »	XIV	22	27·5
1903. April 11. 2 Plaice (No. 713—714). 18 miles WNW of Horn Reef Lightship. 17-18 fms. 55°38′ N 6°48′ E "Thor" St. 40. Experiment No. IV	1903 August 21	714	♂	310 miles NE by E ¼ E from the Inner Dowsing	57°4′ N 7°6′ E	English S. S.	IV	40·5	42
1903. April 11. 286 Plaice (No. 715—1000). 2 à 3 miles N of Tuxen. Horn Reef. 6—7 fms. 55 35′ N 7°40′ E "Thor" St. 41. Experiment No. V	1903 April 18	751	♀	2 miles E of Vyl Lightship. 10 fms.	55 24′ N 7°49′ E	Danish Kutter	0	32	31
	» » 18	758	♂	3 miles NW of Slugen. 9 fms.	55°35′ N 7°47′ E	» »	0	26	25
	» » 18	785	♀	½ mile E of Vyl Lightship. 10 fms.	55°24′ N 7°46′ E	» »	0	24·5	23·5
	» » 18	802	♀	N of Slugen	55 35′ N 7°47′ E	» »	0	31·5	30·5
	» » 18	832	♂	1 mile SW of Vyl buoy. 10 fms.	55°26′ N 7°49′ E	» »	0	27·5	27
	» » 18	835	♂	Northern part of Slugen	55°34′ N 7°47′ E	» »	0	32	31·5
	» » 18	884	♂	Northern part of Slugen	55°34′ N 7°47′ E	» »	0	28	28
	» » 18	949	♂	N of Slugen	55°35′ N 7°47′ E	» »	0	28	27·5

Table A. Continued.

Particulars of Liberation. Date. No. of Fish. Locality etc.	Particulars of Recovery									
	Date	No. on Label	Sex	Locality	Central Position (Approximately)	Fishing Vessel	No. of months between Liberation and Recovery	Initial Size	Ultimate Size
1903. April 11. 286 Plaice (No. 715—1000). 2 à 3 miles N of Tuxen. Horn Reef. 6—7 fms. 55°35′ N 7°40′ E "Thor" St. 41. Experiment No. V	1903 April 23	883	♂	Northern part of Slugen	55°34′ N 7°47′ E	Danish Kutter	0	25·5	24·5
	» » 24	748	♂	3 miles N by W of Slugen N. 10 fms.	55°36′ N 7°50′ E	» »	0	30·5	30
	» » 24	759	♀	1 mile W by N of the light buoy. Slugen. 9 fms.	55°33′ N 7°48′ E	» »	0	29·5	29
	» » 24	763	♂	1 mile NNW of Slugen N. 10 fms.	55°33′ N 7°50′ E	» »	0	28·5	28
	» » 24	765	♀	6 miles NW of Slugen N. 10 fms.	55°36′ N 7°43′ E	» »	0	25	24
	» » 24	767	♂	6 miles NW of Slugen N. 7 fms.	55°36′ N 7°43′ E	» »	0	29	27
	» » 24	782	♀	1 mile N of the light buoy Slugen N. 10 fms.	55°33′ N 7°50′ E	» »	0	29·5	29
	» » 24	783	♂	3 miles N of Slugen N. 10 fms.	55°36′ N 7°50′ E	» »	0	26·5	26·5
	» » 24	786	♂	14 miles W of Graadeep. 10 fms.	55°22′ N 7°51′ E	» »	0	27·5	27
	» » 24	794	♀	1 mile NNW of Slugen N. 10 fms.	55°33′ N 7°50′ E	» »	0	28	27·5
	» » 24	806	♂	2 miles NNW of Munken.	55°33′ N 7°50′ E	» »	0	24	23
	» » 24	823	♂	1 mile W by N of the light buoy. Slugen. 9 fms.	55°33′ N 7°50′ E	» »	0	26·5	26
	» » 24	831	♀	2 miles NW of Slugen N. 10 fms.	55°35′ N 7°48′ E	» »	0	30	29·5
	» » 24	840	♀	4 miles E of Vyl Lightship. 10 fms.	55°25′ N 7°52′ E	» »	0	27	26
	» » 24	847	♀	3 miles NW of Slugen N. 10 fms.	55°35′ N 7°48′ E	» »	0	30	30
	» » 24	872	♀	6 miles SE by S of Vyl Lightship. 10 fms.	55°20′ N 7°53′ E	» »	0	26	25
	» » 24	878	♂	1 mile NNW of Slugen N. 10 fms.	55°34′ N 7°50′ E	» »	0	29·5	28·5
	» » 24	885	♀	4 miles SE of Vyl buoy	55°22′ N 7°51′ E	» »	0	27·5	27
	» » 24	886	♂	3 miles NW of Slugen N. 10 fms.	55°35′ N 7°48′ E	» »	0	25	
	» » 24	925	♂	3 miles E of Vyl buoy. 8½ fms.	55°27′ N 7°55′ E	» »	0	28·5	27·5
	» » 24	940	♀	6 miles NW of Slugen N. 10 fms.	55°36′ N 7°48′ E	» »	0	32·5	32
	» » 25	826	♀	4 miles SE of Vyl buoy. 9 fms.	55°22′ N 7°51′ E	» »	0	29·5	28·5
	» » 25	928	♀	North Sea		» »	0	29	29·5
	» » 26	792	♂	North Sea		» »	0	25·5	25
	» » 26	799	♀	4 miles SE of Vyl buoy	55°24′ N 7°56′ E	» »	0	26·5	26
	» » 26	809	♀	North Sea		» »	0	26·5	25·5
	» » 26	926	♀	3 miles NW of Slugen. 10 fms.	55°35′ N 7°48′ E	» »	0	29	28·5
	» » 27	726	♀	6 miles WNW of Graadeep. 7 fms.	55°27′ N 8°5′ E	» »	0	35	34
	» » 27	845	♀	6 miles WSW of Graadeep. 7 fms.	55°22′ N 8°6′ E	» »	0	25·5	25
	» » 27	976	♀	2 miles SE of Vyl buoy. 9 fms.	55°25′ N 7°53′ E	» »	0	26·5	26
	» » 28	769	♀	8 miles W of Graadeep. 8 fms.	55°24′ N 8°1′ E	» »	0	32·5	32
	» » 28	921	♂	6 miles W by N of Graadeep. 8 fms.	55°25′ N 8°4′ E	» »	0	27	26·5
	» » 28	986	♂	4 miles SE of Vyl buoy. 9 fms.	55°24′ N 7°56′ E	» »	0	30	29·5
	» » 29	825	♀	North Sea		» »	0	28·5	27·5
	» » 29	849	♀	Off Ringebjerge Bn. 7 fms.	55°37′ N 8°5′ E	» »	0	28·5	27·5
	» » 29	933	♂	4 miles SW by W of Graadeep. 7 fms.	55°23′ N 8°10′ E	» »	0	28	27·5
	» » 29	941	♂	2 miles E by S of Vyl Lightship. 9 fms.	55°24′ N 7°49′ E	» »	0	28·5	28
	» » 29	944	♂	3 miles NW of Ringebjerge Bn. 7 fms.	55°39′ N 8°3′ E	» »	0	29·5	28
	» » 29	957	♂	4 miles N of Horn Reef. 6 fms.	55°38′ N 7°42′ E	» »	0	28·5	
	» » 30	775	♂	6 miles W by N of Graadeep. 7 fms.	55°20′ N 8°4′ E	» »	0	30	29·5
	» » 30	843	♂	7 miles W of Graadeep. 8 fms.	55°24′ N 8°3′ E	» »	0	27·5	27
	» » 30	910	♀	7 miles W of Graadeep. 8 fms.	55°24′ N 8°3′ E	» »	0	27·5	26·5
	» 30	916	♀	3 miles NW of Blaavand Point	55°35′ N 8°0′ E	» »	0	31·5	30
	» » 30	939	♂	1 mile SE of Vyl buoy. 9 fms.	55°26′ N 7°52′ E	» »	0	34	32·5
	» » 30	998	♀	4 miles WSW of Graadeep. 7 fms.	55°24′ N 8°10′ E	» »	0	28	28
	» »	954	♂	3 miles W of Vyl Lightship. 10 fms.	55°23′ N 7°40′ E	» »	0	26	25
	» May 1	788	♂	2 miles W of Cancer. 8 fms.	55°29′ N 7°59′ E	» »	1	30	30·5
	» » 1	790	♀	3 miles NE of Slugen. 5½ fms.	55°36′ N 7°55′ E	» »	1	30	28·5
	» » 1	914	♂	4 miles NNE of Ringkøbingdeep. 5 fms.	55°40′ N 8°2′ E	» »	1	29·5	29
	» » 2	830	♀	1 mile SW by W of Cancer. 8 fms.	55°29′ N 8°1′ E	» »	1	34	33·5
	» » 2	934	♀	4 miles W of Graadeep. 7 fms.	55°25′ N 8°8′ E	» »	1	28	27
	» » 2	964	♀	2 miles W of Kærgaarde Bn. 6½ fms.	55°42′ N 8°6′ E	» »	1	24·5	24
	» » 3	737	♀	5 miles N of Kærgaarde Bn. 7 fms.	55°46′ N 8°8′ E	» »	1	32·5	33
	» » 3	909	♂	4 miles W by N of Ringebjerge Bn. 6 fms.	56°37′ N 8°0′ E	» »	1	30	29·5
	» » 4	980	♂	Northern part of Slugen. 8 fms.	55°34′ N 7°47′ E	» »	1	29	28·5

Table A. Continued.

Particulars of Liberation. Date. No. of Fish. Locality etc.	Particulars of Recovery										
	Date			No. on Label	Sex	Locality	Central Position (Approximately)	Fishing Vessel		No. of months between Liberation and Recovery	Initial Size	Ultimate Size
1903. April 11. 286 Plaice (No. 715—1000). 2 à 3 miles N of Tuxen. Horn Reef. 6—7 fms. 55°35′ N 7°40′ E "Thor" St. 41. Experiment No. V	1903	May	5	715	♂	2 miles SW of Kærgaarde Bn. 7 fms.	55°40′ N 8°6′ E	Danish Kutter		I	24·5	23·5
	»	»	5	760	♂	Close W of Slugen N. 13 fms.	55°33′ N 7°51′ E	»	»	I	30	30
	»	»	5	764	♀	20 miles NE of Horn Reef. 9 fms.	55°51′ N 7°37′ E	English S. S.		I	26	26
	»	»	5	771	♂	1 mile SW of Kærgaarde Bn. 5½ fms.	55°41′ N 8°7′ E	Danish Kutter		I	26	28·5
	»	»	5	797	♂	3 miles SW of Kærgaarde Bn. 6 fms.	55°40′ N 8°6′ E	»	»	I	27·5	27
	»	»	5	908	♂	North Sea		»	»	I	28	
	»	»	6	739	♀	3 miles W of Ringebjerge Bn. 6 fms.	55°37′ N 8°2′ E	»	»	I	31·5	31
	»	»	6	747	♂	Northern part of Slugen. 10 fms.	55°33′ N 7°49′ E	»	»	I	28·5	27
	»	»	6	757	♀	4 miles NW of Ringebjerge Bn. 6 fms.	55°39′ N 8°2′ E	»	»	I	31·5	32
	»	»	6	848	♀	Northern part of Slugen. 10 fms.	55°34′ N 7°47′ E	»	»	I	27·5	28
	»	»	6	961	♀	2 miles N by W of Slugen N. 12 fms.	55°34′ N 7°49′ E	»	»	I	26·5	26
	»	»	6	973	♀	Northern part of Slugen. 10 fms.	55°34′ N 7°47′ E	»	»	I	26	25
	»	»	7	752	♀	1 mile W of Kærgaarde Bn. 5 fms.	55°42′ N 8°7′ E	»	»	I	30·5	30
	»	»	7	812	♀	4 miles N of Slugen. 9 fms.	55°37′ N 7°50′ E	»	»	I	20·5	20·5
	»	»	7	817	♂	4 miles N of Slugen. 9 fms.	55°37′ N 7°50′ E	»	»	I	30	29
	»	»	7	827	♀	4 miles N of Slugen. 9 fms.	55°37, N 7°50′ E	»	»	I	29	28·5
	»	»	7	838	♂	3 miles SE of Vyl Lightship. 9 fms.	55°22′ N 7°50′ E	»	»	I	28·5	28
	»	»	7	867	♂	1 mile W of Slugen N. 12 fms.	55°33′ N 7°50′ E	»	»	I	30	29·5
	»	»	10	731	♀	3 miles NW of Kærgaarde Bn. 6 fms.	55°43′ N 8°5′ E	»	»	I	31	31
	»	»	10	770	♂	2 miles NE of Slugen. 7 fms.	55°35′ N 7°54′ E	»	»	I	27	26
	»	»	10	776	♂	2 miles W of Kærgaarde Bn. 7 fms.	55°41′ N 8°6′ E	»	»	I	26·5	26
	»	»	10	778	♀	3 miles NW of Kærgaarde Bn. 6 fms.	55°43′ N 8°5′ E	»	»	I	26·5	25·5
	»	»	10	889	♂	2 miles N of Slugen. 7 fms.	55°35′ N 7°51′ E	»	»	I	28	28
	»	»	10	960	♂	3 miles SW of Ringebjerge Bn. 7 fms.	55°36′ N 8°3′ E	»	»	I	25	24
	»	»	11	874	♀	6 miles W of Kærgaarde Bn. 6 fms.	55°40′ N 7°59′ E	»	»	I	29	29
	»	»	12	876	♂	North Sea		»	»	I	24·5	
	»	»	14	981	♂	Off Horn Reef Lightship, bearing NE distance 3 miles	55°32′ N 7°17′ E	English S. S.		I	27·5	
	»	»	22	772	♀	3 miles NW of Slugen. 11 fms.	55°35′ N 7°48′ E	Danish Kutter		I	24·5	24
	»	»	22	814	♀	North Sea		»	»	I	28	27
	»	»	22	882	♂	3 miles NW of Slugen. 11 fms.	55°35′ N 7°48′ E	»	»	I	27	26
	»	»	22	922	♂	1 mile NW of Slugen. 13 fms.	55°34′ N 7°50′ E	»	»	I	25·5	25
	»	»	22	936	♀	3 miles NW of Kærgaarde Bn. 8 fms.	55°43′ N 8°5′ E	»	»	I	30	29·5
	»	»	23	918	♀	3 miles NW of Slugen. 7 fms.	55°35′ N 7°48′ E	»	»	I	31	31
	»	»	26	868	♂	2 miles NW of Kærgaarde Bn.	55°43′ N 8°7′ E	»	»	I	28	27·5
	»	»	26	923	♂	2 miles NW of Kærgaarde Bn. 7 fms.	55°43′ N 8°7′ E	»	»	I	27	27
	»	»	28	766	♀	4 miles S of Vyl Lightship. 11 fms.	55°20′ N 7°47′ E	»	»	I	39	38
	»	»	28	904	♀	6 miles NW of Slugen N. 10 fms.	55°36′ N 7°43′ E	»	»	I	28·5	28·5
	»	»	29	839	♀	4 miles W of Kærgaarde Bn. 7 fms.	55°41′ N 8°2′ E	»	»	I	29	28·5
	»	»	29	902	♀	Lat. 55°43′ N Long. 7°43′ E	55°43′ N 7°43′ E	English S. S.		I	30	31
	»	»	30	977	♂	16 miles NW of Amron Light. 10 fms.	54°45′ N 7°57′ E	Danish Kutter		I	27	26
	»	»	31	733	♀	Lat. 55°45′ N Long. 7°50′ E	55°45′ N 7°50′ E	English S. S.		I	25·5	
	»	June	4	723	♀	2 miles W of Kærgaarde Bn. 7 fms.	55°41′ N 8°6′ E	Danish Kutter		II	30·5	29
	»	»	8	781	♂	4 miles S of Vyl Lightship. 11 fms.	55°20′ N 7°47′ E	»	»	II	27	
	»	»	9	873	♀	9 miles NW of Blaavand Point	55°39′ N 7°52′ E	English S. S.		II	28	29
	»	»	10	852	♀	12 miles NW of Slugen N. 13 fms.	55°41′ N 7°25′ E	Danish Kutter		II	27·5	28
	»	»	12	905	♀	1 mile SE of Vyl Lightship. 10 fms.	55°23′ N 7°47′ E	»	»	II	30·5	
	»	»	16	791	♀	12 miles NE of Horn Reef Lightship. 11 fms.	55°45′ N 7°31′ E	»	»	II	28	
	»	»	19	851	♀	North Sea		English S. S.		II	26	
	»	»	23	850	♀	Close to Horn Reef outer Lightship. (285 miles ENE of Spurn)	55°34′ N 7°20′ E	»	»	II	32	33·5
	»	»	23	899	♀	½ mile N of Horn Reef. Northern part of Slugen. 10 fms.	55°35′ N 7°45′ E	Danish Kutter		II	27	27·5
	»	July	2	810	♀	5 miles NNE of Horn Reef Lightship. 12 fms.	55°39′ N 7°21′ E	»	»	III	27·5	29
	»	»	4	756	♀	5 miles S of Horn Reef Lightship. 16 fms.	55°30′ N 7°14′ E	»	»	III	32	32
	»	»	15	955	♂	Lat. 56° N Long. 6° E	56°0′ N 6°0′ E	German S. S.		III	28	28
	»	August	17	754	♂	20 miles NW of Horn Reef Lightship	55°46′ N 6°50′ E	Danish Kutter		IV	28	
	»	»	26	798	♂	North Sea		German S. S.		IV	29	30·5

Table A. Continued.

Particulars of Liberation. Date. No. of Fish. Locality etc.	Particulars of Recovery								
	Date	No. on Label	Sex	Locality	Central Position (Approximately)	Fishing Vessel	No. of months between Liberation and Recovery	Initial Size	Ultimate Size
1903. April 11. 286 Plaice (No. 715—1000). 2 à 3 miles N of Tuxen. Horn Reef. 6—7 fms. 55°35′ N 7°40′ E "Thor" St. 41. Experiment No. V	1903 Sept. 6	735	♂	290 miles ENE from Spurn		English S. S.	V	30·5	
	» » 18	820	♂	Lat. 55°30′ N Long. 6°10′ E	55°30′ N 6°10′ E	German S. S.	V	23·5	25
	» » 29	906	♂	North Sea		» »	V	31	32·5
	» October 15	895	♀	Lat. 56°35′ N Long. 5°40′ E	56°35′ N 5°40′ E	English S. S.	VI	28·5	30
	» Nov. 10	890	♀	Fanø road at Sandodde buoy. 3 fms.	55°29′ N 8°23′ E	Dan. Fishingb.	VII	25·5	28·5
	» Decbr. 24	920	♀	Lat. 55°18′ N Long. 7°0′ E	55°18′ N 7°0′ E	German S. S.	VIII	26·5	28
	1903 April 15	780	♀	230 miles ENE from Spurn. 28 fms.	55°57′ N 5°13′ E	English S. S.	XII	28	32
	» » 28	746	♂	7 miles W of Sylt Light	54°55′ N 8°11′ E	» »	XII	16	19
	» May 2	901	♂	3miles WSW of the bell buoy. Graadeep. 7 fms.	55°24′ N 8°9′ E	Danish Kutter	XIII	25·5	26·5
	» » 14	881	♂	16 miles SW of Graadeep. 9 fms.	55°13′ N 8°1′ E	» »	XIII	26·5	30
	» June 4	793	♀	12 miles WSW of Graadeep. 9 fms.	55°19′ N 7°59′ E	» »	XIV	26·5	
1903. April 17. 2 Plaice (No. 1001—1002). 10 miles NW ½ N of Hirshals. 26 fms. 57°41′ N 9°38′ E. "Thor" St. 49. Experiment No. VI	1903 April 23	1002	♀	Hirshalsrende N of Hirshals. 10 fms.	57°37′ N 9°55′ E	Dan. Fishingb.	0	34	33
	» May 29	1001	♂	Off Gl. Skagen. 20 fms.	57°45′ N 10°30′ E	Danish Kutter	I	31	30
1903. April 17. 12 Plaice (No. 1003—1004). 3 à 4 miles W by N of Kjettrup. Jammerbugt. 6-8 fms. 57°19′ N 9°33′ E. "Thor" St. 51. Experiment No. VII	1903 April 29	1011	♀	Off Bulbjerg. 4 fms.	57°10′ N 9°2′ E	Danish Kutter	0	30	30·5
	» May 12	1008	♀	Near Blokhus	57°21′ N 9°33′ E	Dan. Fishingb.	I	21	22
	» July 21	1006	♀	24 miles NNE of Hanstholm. 26 fms.	57°31′ N 8°44′ E	Danish Kutter	III	32	35
	» » 25	1013	♂	ESE of Hirshals		» »	III	22	25·5
	» August 1	1010	♀			» »	IV	27	32
	» Nov. 19	1014	♀	3 miles NE of Hirsholmene	57°32′ N 10°41′ E	» »	VII	18	28
	1904 June 6	1007	♀	1 mile NW of Løkken		Dan. Fishingb.	XIV	21	32
1903. April 17. 6 Plaice (No. 1015—1020). 6 miles W by N of Kjettrup. Jammerbugt. 7 fms. 57°19′ N 9°28′ E "Thor" St. 52. Experiment No. VIII	1903 June 28	1020	♀	N of Hanstholmen. 7 fms.	57°8′ N 8°37′ E	Danish Kutter	II	30	30
1903. April 17. 13 Plaice (No. 1021—1033). 11 miles NE of Bulbjerg. 9—10 fms 57°20′ N 9°10′ E "Thor" St. 53. Experiment No. IX	1903 April 26	1029	♀	2 miles off Thyborøn	56°44′ N 8°9′ E	Dan. Fishingb.	0	24	23
	» » 29	1032	♂	SSE of Svinkleven. 7 fms.	57°17′ N 9°6′ E	Danish Kutter	0	20	20
	» » 29	1023	♀	12 miles WNW of Løkken	57°23′ N 9°20′ E	» »	0	35	34·5
	» May 1	1025	♂	Off Thyborøn. 10 fms.	56°44′ N 8°9′ E	» »	I	30	29·5
	» » 6	1033	♀	Near Blokhus	57°21′ N 9°33′ E	Dan. Fishingb.	I	18	17·5
	» » 21	1021	♀	Near the Bn. Vikse Bay	57°7′ N 8°46′ E	Danish Kutter	I	33	32·5
	» » 28	1028	♀	1 mile NW of Løkken. 5—6 fms.	57°23′ N 9°40′ E	» »	I	29	29·5
	» » 29	1027	♂	1 mile of Bovbjerg	56°30′ N 8°0′ E	Dan. Fishingb.	I	28	
	June 9	1024	♀	20miles N by E of Horn Reef Lightship. 12fms.	55°54′ N 7°20′ E	Danish Kutter	II	33	
	» » 20	1022	♂	Vikse Bay. 5 fms.	57°8′ N 8°48′ E	» »	II	33	35
	» Sept. 7	1026	♀	25 miles NW of Holman Light		English S. S.	V	36	39·5
	» » 22	1031	♂	NW of Hanstholmen. 11 fms.	57°9′ N 8°30′ E	Danish Kutter	V	21	28
1903. April 18. 19 Plaice (No. 1034—1052). 10 miles NE of Bulbjerg. 7—9 fms. 57°17′ N 9°11′ E "Thor" St. 54. Experiment No. X	1903 April 20	1036	♀	2 miles NE of Bulbjerg. 7 fms.	57°16′ N 9°9′ E	Danish Kutter	0	26	26
	» » 27	1039	♂	NW of Svinkleven. 5½ fms.	57°12′ N 9°10′ E	» »	0	23·5	23·5
	» May 21	1041	♂	Near Bulbjerg. 10 fms.		» »	I	22	22·5
	» » 27	1045	♂	6 miles N by E of Svinkleven	57°15′ N 9°12′ E	» »	I	29.5	30·5
	» July 25	1035	♂	NW of Løkken. 17 fms.	57°34′ N 9°3′ E	» »	III	22	27
	1904 June	1043	♂	N by E of Hanstholmen, distance 32 miles. 30 fms.	57°27′ N 8°35′ E	» »	XIV	21	36

Table A. Continued.

Particulars of Liberation. Date. No. of Fish. Locality etc.	Particulars of Recovery								
	Date	No. on Label	Sex	Locality	Central Position (Approximately)	Fishing Vessel	No. of months between Liberation and Recovery	Initial Size	Ultimate Size
1903. April 21. 2 Plaice (No. 1053—1054). 1 mile N of Skagens Light. 10 fms. 57° 46′ N 10°36′E. "Thor" St. 58. Experiment No. XI	1903 May 29	1053	♀	Near Skagens Lightship. 20 fms.	57°46′ N 10°43′ E	Dan. Fishingb.	I	37	
1903. April 21-22. 45 Plaice (No 1055-1099). 2 à 4 miles NNV-NNE of Tversted, Skagerak. 8-12 fms. 57° 38′ N 10°12′E. "Thor" St. 59. Experiment No. XII	» May 1	1055	♀	1 mile NE of Hirshals. 10 fms.	57°37′ N 9°59′ E	Dan. Fishingb.	I	20·5	20·5
	» » 12	1086	♂	Tannis Bay. 8 miles E of Hirshals. 400 fms. off shore	57°36′N 10°12′ E	» »	I	31	30·5
	» » 22	1092	♀	N of Hirshals. 15 fms.	57°39′ N 9°54′ E	Danish Kutter	I	29·5	29·5
	» June 1	1095	♀	6 miles E of Hirshals. ½ mile off shore	57°36′ N 10°8′ E	Dan. Fishingb.	II	25·5	25
	» July 20	1093	♀	NNW of Hanstholmen. 22 fms.	57°18′ N 8°20′ E	Danish Kutter	III	32	35
	» » 28	1096	♀	WNW of Hirshals. 20 fms.	57°38′ N 9°35′ E	» »	III	32	35
	» August 26	1056	♂	Off Kandestederne. 6 miles f. the shore. 30 fms.	57°44′ N 10°16′ E	» »	IV	28	33
1903. April 22. 14 Plaice (No. 1100-1113). 1 à 2 miles N of Tversted, Skagerak. 4-7 fms. 57°36′N 10°12·E "Thor" St. 60. Experiment No. XIII	1903 April	1105	♂	Off Vangsaa	57°2′ N 8°27′ E	Dan. Fishingb.	0	16	
	» May 12	1107	♂	Beach at Tversted. 2 fms.	57°36′ N 10°10′ E	» »	I	24	23
	» » 27	1111	♂	1 mile W of Hirshals	57°35′ N 9°55′ E	» »	I	17·5	17
	» June 29	1106	♀	3 miles off Tversted. 8 fms.	57°39′ N 10°10′ E	» »	II	28	30
	» Sept. 24	1113	♂	NW of Tversted. 10 fms.	57°39′ N 10°0′ E	Danish Kutter	V	16	24
1903. April 22. 8 Plaice (No. 1114-1121). 4 miles NE of Hansth. 13-15 fms. 57°11′ N 8°40′ E. "Thor" St. 61. Experiment No. XIV									
1903. April 23. 21 Plaice (No. 1122—1142). 5 miles WSW of Bjergehuse Bn. North Sea. 11-13 fms. 56°19′ N 7°58′E. "Thor" St. 62. Experiment No. XV	1903 June 8	1131	♀	5 miles W of Nymindegab. 9 fms.	55°47′ N 8°3′ E	Danish Kutter	II	28·5	28·5
	» » 17	1129	♀	Lat. 56°24′ N Long. 6°18′ E	56°24′ N 6°18′ E	English S. S.	II	31·5	34
	» July 15	1122	♂	Lat. 56°0′ N Long. 6°0′ E. 26 fms.	56°0′ N 6°0′ E	German S. S.	III	29	31
	» » 22	1124	♂	Lat. 56°10′ N. 290 miles ENE from Spurn Head	56°10′ N 7°16′ E	English S. S.	III	24	26·5
	» August 31	1126	♀	300 miles NE by ½ E from Spurn. Lat. 57°10′ N	57°10′ N 6°10′ E	» »	IV	33	36
1903. April 23. 48 Plaice (No. 1143-1190). 1½ miles W of Torup Bn. 9—10 fms. 57° 0′ N 8°22′E. "Thor" St. 64. Experiment No. XVI	1903 April 26	1145	♂	2 miles off Thyborøn	56°43′ N 8°9′ E	Dan. Fishingb.	0	28	26
	» » 27	1164	♂	3 miles NNW off Thyborøn	56°45′ N 8°9′ E	Danish Kutter	0	34	33·5
	» » 29	1146	♀	Off Vorupør. 8 fms.	56°58′ N 8°19′ E	» »	0	29	28·5
	» May 4	1176	♀	Off Harboøre, ¼ mile distant	56°41′ N 8°9′ E	Dan. Fishingb.	I	30	29·5
	» » 12	1152	♂	3 miles of Lodbjerg	56°50′ N 8°10′ E	» »	I	22	22
	» » 12	1168	♂	Off Vorupør. 8 fms.	56°58′ N 8°21′ E	Danish Kutter	I	20	
	» » 12	1172	♀	Off Vorupør. 8 fms.	56°58′ N 8°21′ E	» »	I	29	
	» » 12	1178	♀	Off Vorupør. 8 fms.	56°58′ N 8°21′ E	» »	I	31·5	
	» » 12	1185	♀	Off Vorupør. 8 fms.	56°58′ N 8°21′ E	» »	I	23·5	
	» » 13	1147	♀	Off Vangsaa. 700 fms. from the shore	57°2′ N 8°27′ E	» »	I	34	34
	» » 27	1167	♀	Vangshuk. 2 fms.	57°2′ N 8°27′ E (?)	Dan. Fishingb.	I	30	30·5
	» June 8	1154	♀	Off Klitmøller. 6 fms.	57°3′ N 8°28′ E	Danish Kutter	II	27	27·5
	» » 9	1180	♂	Off Hanstholm. 10 fms.	57°8′ N 8°35′ E	» »	II	31·5	33
	» July 28	1183	♀	20 miles (S)SW of Hanstholm (?)		» »	III	32	33
	1904 May 10	1165	♀	8 miles off Klitmøller	57°4′ N 8°15′ E	» »	XIII	27	36·5
	» » 10	1190	♀	NE off Bulbjerg. 6 fms.	57°13′ N 9°4′ E	» »	XIII	26	33
	» June 10	1155	♀	10 miles S of Horn Reef Lightship	55°24′ N 7°20′ E	English S. S.	XIV	31	39·5

Table A. Continued.

Particulars of Liberation. Date. No. of Fish. Locality etc.	Particulars of Recovery: Date	No. on Label	Sex	Locality	Central Position (Approximately)	Fishing Vessel	No. of months between Liberation and Recovery	Initial Size	Ultimate Size
1903. April 23. 30 Plaice (No. 1191-1220) 3 miles W of Hanstholm. 12 fms. 57°5′ N 8°31′ E Experiment No. XVII	1903 April 26	1209	♀	2 miles of Thyhorøn	56°44′ N 8°9′ E	Dan. Fishingb.	0	19·5	18
	» May 11	1211	♀	3 miles SW by S of Bjergehuse Bn. 8 fms.	56°17′ N 8°4′ E	Danish Kutter	I	26·5	25·5
	» » 12	1196	♀	Vixø Bay. 3½ fms., 100 fms. distance from shore	57°8′ N 8°48′ E	» »	I	31·5	31
	» » 20	1220	♀	Off Vangsaa	57°2′ N 8°27′ E	» »	I	16	
	» » 27	1210	♂	Vixø Bay. 3 fms.	57°8′ N 8°48′ E	» »	I	30	31·5
	» June 19	1193	♂	Off Vangsaa. 9 fms.	57°2′ N 8°25′ E	» »	II	31·5	32
	» July 28	1199	♀	27 miles SSW of Hanstholmen		» »	III	33	35
	» Sept. 23	1200	♀	Lat. 57°21′ N Long. 7°28′ E	57°21′ N 7°28′ E	German S. S.	V	41·5	
	» »	1205	♀	Off Vorupør. 1 mile from shore	56°58′ N 8°20′ E	Dan. Fishingb.	V	26	27
	1904 April 12	1191	♀	12 miles W of Blokhusene. 10 fms.	57°20′ N 9°10′ E	Danish Kutter	XII	28	37
	» » 24	1201	♀	Off Klitmøller, 2 miles from shore. 11 fms.	57°4′ N 8°28′ E	» »	XII	25	31

Table B.

	S of Horn Reef								N of Horn Reef												West coast of Jutland. Nissum Fjord—Hanstholm											
	Experiment No. 2				Experiment No. 3				Experiment No. 1				Experiment No. 4				Experiment No. 5				Experiment No. 15				Experiment No. 16				Experiment No. 17			
	♂		♀		♂		♀		♂		♀		♂		♀		♂		♀		♂		♀		♂		♀		♂		♀	
	Lib.	Rec.	Lib.	Rec.	Lib.	Rec.	Lib.	Rec.	Lib.	Rec.	Lib.	Rec.	Lib.	Rec.	Lib.	Rec.	Lib.	Rec.	Lib.	Rec.	Lib.	Rec.	Lib.	Rec.	Lib.	Rec.	Lib.	Rec.	Lib.	Rec.	Lib.	Rec.
12 cm.	..	..	..	..	..	..	..	..	1																							
13 »	..	..	..	..	..	..	..	..	2	1	2	..	..	..	..	..	..	..	..	..									1	..	1	
14 »	2	..	..	..	..	..	..	..	1	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	..		
15 »	4	..	1	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1	.	4	.
16 »	9	2	8	1	..	..	..	..	..	..	1	..	..	..	..	..	2	1	1	..	..	..	2	..	3				..	.	1	1
17 »	16	1	11	1	1	..	1	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	1	..	3	..	1	..	..	..	..	..
18 »	9	..	3	1	7	1	2	..	..	..	..	..	..	..	..	..	2	..	4	..	..	..	..	..	..	..	..	..	..	..	..	..
19 »	10	..	5	1	4	..	4	..	..	..	..	..	..	..	..	..	2	..	..	..	1	..	..	..	1	..			..	.	1	1
20 »	6	1	6	2	7	..	8	2	..	..	..	..	..	..	..	..	..	..	3	1	1	..	..	..	2	1	1	..	.		..	..
21 »	17	5	8	1	15	1	10	1	..	..	..	..	..	..	..	..	..	..	..	..	3	..	..	..	..	..	2	..	1	.	..	
22 »	18	2	12	3	22	5	16	1	..	..	1	1	..	..	..	..	2	..	1	..	..	..	..	..	1	1	1	.	..	.	..	..
23 »	17	3	9	4	40	7	19	6	1	..	..	..	..	..	..	..	4	1	2	..	..	..					1	1	.	.	.	
24 »	11	4	7	3	49	13	29	7	..	..	..	..	..	..	..	..	8	3	11	3	2	1	..	..	..	..	1	..	1	..	1	
25 »	23	7	9	3	37	9	26	3	..	..	..	..	..	..	..	..	14	6	11	4	2	..	..	..	..		2		.	.	1	1
26 »	8	6	8	3	26	11	32	10	..	..	..	..	..	..	..	..	19	7	18	11	1	..	1	..	1		1	1	.	.	2	2
27 »	6	4	4	3	23	8	13	7	..	..	..	..	..	..	..	..	19	11	13	7	..	..	..	..	1	..	3	2	.	.	.	.
28 »	2	..	1	1	11	6	18	9	..	..	..	..	1	..	..	..	30	14	22	11	..	..	2	1	1	1	1	.	.	.	2	1
29			2	1	8	1	5	3									19	6	15	8	1	1			1		3	2	.	.	1	..
30 »	1	..	..	..	2	1	1	..	..	..	..	..	..	..	..	..	15	9	17	8	..	..	..	..	2	..	2	2	1	1		..
31 »	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	3	1	9	6	..	..	1	1	1	1	3	2	1	1	1	1
32 »	..	..	1	..	1	1	4	2	..	..	..	..	..	..	..	..	4	1	10	6	..	..	..	..	1		2	1	.	.	.	.
33 »	..	..	1	..	..	..	2	1	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1	1	..	.	1	.	.	..	2	1
34 »	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	1	1	1	1	..	..	..	..	1	1	1	1	1	.	1	..
35 »	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	..	..	..	..	..		1	.	.	.	.	.
36 »	..																		..				1				.		.	.	.	.
37 »																			..								.		.	.	.	.
38																					..	..					1					
39 »																			1	1					1							
40													1	1																		
41 »	..	..																											.	.	1	1
42																					..	..									1	
43																																
44 »																																
Total .	159	35	96	28	254	67	191	52	5	1	7	1	2	1	..	..	145	61	141	68	11	2	10	3	20	5	28	12	10	2	20	9

Table A. offers a survey stating the increase in length of the plaice between liberation and recovery. From the table below it will be seen, how much this increase in length indicates in weight. The plaice concerned were caught in the North Sea and the Skagerak in September and October of 1903, the individuals of less than 32 cm. being almost all immature.

Relation of Length to Weight.

Length in cm.	Average weight in Gram	No. of specimens weighed	Length in cm.	Average weight in Gram	No. of specimens weighed	Length in cm.	Average weight in Gram	No. of specimens weighed	Length in cm.	Average weight in Gram	No. of specimens weighed
12....	19	40	23....	119	40	34....	400	20	45....	945	4
13....	23	40	24....	128	40	35....	425	20	46....	970	7
14....	28	40	25....	152	40	36....	455	20	47....	1180	8
15....	35	40	26....	168	40	37....	525	20	48....	1190	4
16....	44	40	27....	188	40	38....	600	20	49....	1390	4
17....	50	40	28....	210	40	39....	630	18	50....	1480	1
18....	58	40	29....	235	30	40....	660	17	51....	1590	4
19....	65	40	30....	262	17	41....	695	15	52....	1540	1
20....	74	40	31....	317	9	42....	765	13	53....	1820	1
21....	88	40	32....	340	7	43....	855	9	54....	1830	2
22....	102	40	33....	360	20	44....	930	10			

Table B.

Skagerak

Experiment No. 6				Experiment No. 7				Experiment No. 8				Experiment No. 9				Experiment No. 10				Experiment No. 11				Experiment No. 12				Experim. No. 13				Experim. No. 14			
♂		♀		♂		♀		♂		♀		♂		♀		♂		♀		♂		♀		♂		♀		♂		♀		♂		♀	
Lib.	Rec.	Lib.	Rec.	Lib.	Rec.	Lib.	Rec.	Lib.	Rec.	Lib.	Rec.	Lib.	Rec.	Lib.	Rec.	Lib.	Rec.	Lib.	Rec.	Lib.	Rec.	Lib.	Rec.	Lib.	Rec.	Lib.	Rec.	Lib.	Rec.	Lib.	Rec.	Lib.	Rec.	Lib.	Rec.
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	2									
..	..	..	..	..	..	1	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	..	3	..	2	2						
..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	3	..	4	1	1	..	..	..	1	
..	..	..	..	1	..	1	1	1	..	1	..	..	..	1	1	..	..	..	..	..	..	..	..	2	..	2	..	..	..	..	..	1			
..	..	..	..	..	..	1	..	..	..	1	..	..	..	..	..	2	..	..	..	..	..	..	..	1	..	1	..	1	..	1					
..	..	..	..	1	..	..	..	..	..	..	..	2	1	..	..	2	..	2	..	..	..	..	..	..	..	1	1	..	..	2					
..	..	..	..	..	..	2	2	..	..	..	..	1	1	..	..	1	1	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	
..	..	..	..	1	1	..	..	..	..	..	..	..	..	..	..	2	2	1	..	..	..	..	..	..	2	..	1	..	..	..	..	..	1			
..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	2	1	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1			
..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	..	..	..	..	..	..	..	..	3	..	1	..	1	1	..	..	1			
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	1								
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	..	..	..	..	1	..	2	..	..	..	..	..	1			
..	..	..	..	..	..	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	1							
..	..	..	..	..	..	..	..	..	..	..	..	1	1	..	..	1	..	..	..	..	..	..	..	1	1	..	..	..	..	1	1				
..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	2	1	..	..	..	..	..	..	1	..	3	1								
..	..	..	..	..	..	1	1	..	..	1	1	1	1	..	..	..	..	..	..	..	..	1	..	..	..	1									
1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	..	..	..	..	..	..	..	..	1	
..	..	..	..	..	..	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	2								
..	..	..	..	..	..	..	..	..	..	..	..	1	1	2	2																				
..	..	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1											
..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	..	..	1																	
..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1																				
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1												
1	1	1	1	4	1	8	6	3	..	3	1	6	5	7	7	12	5	7	1	..	..	2	1	20	2	25	5	9	4	5	1	5	..	3	..

The Intensity of Fishing.

The percentage of recovered marked plaice from the various localities is as follows:

Locality	No. of Plaice liberated	No. of Plaice recovered	Percentage recovered
South of Horn Reef	700	182	26·0
North » » »	300	132	44·0
Off Nissum Fjord – Hanstholm	99	33	33·3
Total, North Sea	1099	347	31·6
Skagerak	121	41	33·9
Total, North Sea and Skagerak	1220	388	31·8

It will be seen, that the percentage of marked fish on the whole is very considerable. In the cited areas it varies between 26 and 44 %. We dare not directly conclude, that the fishery has been carried on with the greatest intensity in the areas showing the greatest percentage. The larger marked plaice are much more exposed to capture than the smaller ones, as will be shown later on.

If we examine the percentage of the recovered plaice, which were liberated at a size exceeding 25 cm, we obtain the following results in the different areas:

Locality	No. of liberated plaice exceeding 25 cm.	No. of plaice recovered	Percentage recovered
South of Horn Reef	277	103	37·2
North » » »	245	121	49·4
Off Nissum Fjord – Hanstholm	56	27	48·2
Total, North Sea	578	251	43·4
Skagerak	41	24	58·5
Total, North Sea and Skagerak	619	275	44·5

The percentage of the recovered plaice varies here between 37·2 % and 58·5 %. This great percentage suggests, that the fishery in these places is carried on with great intensity. In this connexion it must be remembered, that undoubtedly several of the finds of marked plaice have not been recorded.

The percentage of recovered marked plaice, the two sexes being kept separately, is as follows:

Locality	Sex	No. of Plaice liberated	No. of Plaice recovered	Percentage recovered
South of Horn Reef	♂	413	102	24·7
» » » »	♀	287	80	27·9
North of Horn Reef	♂	152	63	41·4
» » » »	♀	148	69	46·6
Off Hanstholm to Nissum Fjord	♂	41	9	22·0
» » » » »	♀	58	24	41·4
Skagerak	♂	60	18	30·0
»	♀	61	23	37·7
Skagerak and North Sea	♂	666	192	28·8
» » » »	♀	554	196	35·4

It will be noted, that the recovered females show a considerably higher percentage than the males. This fact may be supposed also to hold good with regard to the unmarked plaice. The reason, why

there is caught proportionally more females, may partly be due to their more considerable average size. As shown in the tables below we find the larger plaice much more exposed to capture than the smaller ones.

Length of Plaice	Sex	No. liberated	No recovered	Percentage recovered
10—14 cm.	♂	10	1	10·0
15—19 »	♂	98	8	8·2
20—24 »	♂	250	56	22·4
25—29 »	♂	264	104	39·4
30—34 »	♂	42	22	52·4
35—39 »	♂	1	0	0·0
40—44 »	♂	1	1	100·0
10—14 cm.	♀	4	0	0·0
15—19 »	♀	75	8	10·7
20—24 »	♀	164	40	24·5
25—29 »	♀	227	100	44·1
30—34 »	♀	73	42	57·5
35—39 »	♀	9	5	55·6
40—44 »	♀	2	1	50·0
10 14 cm.	♂ + ♀	14	1	7·1
15—19 »	♂ + ♀	180	16	8·9
20—24 »	♂ + ♀	407	96	23·6
25—29 »	♂ + ♀	491	204	41·6
30—34 »	♂ + ♀	115	64	55·7
35—39 »	♂ + ♀	10	5	50·0
40—44 »	♂ + ♀	3	2	66·7

A survey is given below to show, how many of the 388 recovered plaice were recaptured in each month after the liberation.

	Captured by Danish fishermen	Captured by English fishermen	Captured by German fishermen	Captured by Belgian fishermen	Total
April 1903	102	15	4		121
May »	125	11	1		137
June »	32	12	..	1	45
July »	11	5	4		20
August »	6	7	2		15
September »	3	2	3		8
October »	...	2			2
November »	4	1			5
December »	...	1	1		2
January 1904	...	1			1
February »					0
March »	4				4
April »	7	2			9
May »	9	..	1		10
June »	7	2			9
Total	310	61	16	1	388
Percentage	79·9	15·7	4·1	0·3	

It will be seen, that in this case a disproportionally great number of plaice have been recovered in the two first months after liberation. Many other marking experiments show no tendency in

this direction[1]). It may also be noted, that among our experiments No. I, VI, XIV and XV show nothing to that effect.

The explanation of the phenomenon seems to be this: In the months April, May and June the plaice is wandering from the deeper water towards the shore and is there object of a very intense fishery from the Danish "Kutters". Later on in the summer time the plaice again move out into deeper water and spread over a larger area. It will be noted, that in each of the months: April, May and June of 1904 more marked plaice were recovered than in each month from September of 1903 to March of 1904.

Rate of Growth of Plaice according to the Marking Experiments.

In the tables below, which are extracted from the tables A. and B., a survey of the growth of plaice inside three different areas has been given:

A. Horn Reef Area between N. Lat. 55° 0′—56° 0′
B. Off Nissum Fjord—Hanstholm,
C. The Skagerak.

Date liberated	Month recovered	Period of growth	No. of specimens measured at recovery	Apparent average increase	Least individual increase	Greatest individual increase
Horn Reef Area						
				cm.	cm.	cm.
1903. April 10.—11.	1903. April	1—20 days	96	÷ 0·6	..	1·0
	» May	1 month	101	÷ 0·3	..	2·5
	» June	2 months	23	0·2	..	1·5
	» July	3 »	7	0·9	..	3·0
	» August	4 »	9	1·7	0·5	3·5
	» September	5 »	2	1·5	1·5	1.5
	» October	6 »	2	1·8	1·5	2·0
	» November	7 »	4	2·8	0.5	4·5
	» December	8 »	2	2·3	1·5	3·0
	1904. January	9 »	1	5	5·0	5·0
	» February	10 »	0			
	» March	11 »	4	3·5	1·5	4·0
	» April	12 »	7	3·9	1·5	5·5
	» May	13 »	7	3·4	1·0	6·0
	» June	14 »	4	4·1	2·0	5·5
Off Nissum Fjord—Hanstholm						
				cm.	cm.	cm.
1903. April 23.	1903. April	3—6 days	4	÷ 1·0		
	» May	1 month	7	0·1	..	1·5
	» June	2 months	5	0·9	0·0	2·5
	» July	3 »	4	1·9	1·0	3·0
	» August	4 »	1	3·0	3·0	3·0
	» September	5 »	1	1·0	1·0	1·0
	» October	6 »				
	» November	7 »				
	» December	8 »				
	1904. January	9 »				
	» February	10 »				
	» March	11 »				
	» April	12 »	2	7·5	6·0	9·0
	» May	13 »	2	8·3	7·0	9.5
	» June	14 »	1	8·5	8·5	8·5

[1]) See for inst. C. G. Joh. Petersen "Report from the Danish Biol. St. V p. 48—51" and Report VI p. 34—36; W. Garstang. „Biol. Ass. Plymouth 1903". Batch. I, VIII, IX etc.

Date liberated	Month recovered	Period of growth	No. of specimens measured at recovery	Apparent average increase	Least individual increase	Greatest individual increase
		Skagerak				
				cm.	cm.	cm.
1903. April 17.—22.	1903. April	1—13 days	7	÷ 0·3		
	» May	1 month	13	÷ 0·1	...	1·5
	» June	2 months	4	0·9	...	2·0
	» July	3 »	5	3·5	3·0	5·0
	» August	4 »	2	5·0	5·0	5·0
	» September	5 »	3	6·2	3·0	8·0
	» October	6 »				
	» November	7 »	1	10·0	10·0	10·0
	» December	8 »				
	1904. January	9 »				
	» February	10 »				
	» March	11 »				
	» April	12 »				
	» May	13 »				
	» June	14 »	2	13·0	11·0	15·0

It will be noted, that plaice recovered in the same month when liberated, or in the ensuing month, show on an average a somewhat smaller size at recovery than at liberation. This is naturally due to the shrinkage of the fish after death before remeasurement. This shrinkage may for some individuals amount to ca. 2 cm. (See Table A.) As the average size of 107 individuals recovered during the same month in which they were liberated (April 1903) was reduced 0.6 cm. at the recovery, it will be seen, that the average shrinkage may be estimated to ca. 0.6 cm. It is not probable, that the fish have increased anything worth mentioning during the few days between liberation and recapture in the month of April. It appears from the tables above, that the growth of plaice is very unequal inside the different areas.

In the Horn Reef Area the average-growth amounts annually to ca. 4—5 cm., in the Hanstholm-Nissum Fjord Area to ca. 8 cm. and in the Skagerak at least to 10 cm. This great difference in growth is most likely in correspondance with the unequal frequency of the plaice inside these areas. The plates I—V show the frequency of the plaice to be much greater in the Horn Reef area, where the growth is slow, than inside the two other areas, where it is much more rapid. These facts may possibly be of great economical importance, as it probably will pay to transplant young plaice from areas, where they are overcrowded but grow slowly, to areas, where they are scarce and grow rapidly[1]). Attempts in this direction have commenced from the "Thor" in the spring of 1904, and they have shown, that plaice transplanted to the Skagerak from the Horn Reef grow more than twice as rapidly as those living in the Horn Reef Area.

It appears from the tables above that the average increase in June, July and August is very considerable, while the increase in March and April is insignificant, if there be any at all. The material is too small to throw light on the growth during each month from September to March.

Rate of growth of specimens of different sizes.

In the survey below is stated, how much individuals of different sizes have increased in the lapse of ca. one year (11—14 months) in the Horn Reef Area.

[1]) Such transplantations have for several years shown their rentability in the Limfjord and Dr. Joh. Petersen has already in 1896 suggested that succesful results also might be obtained by transplantation of plaice in the open sea. See Report VI from the Danish Biological Station.

Size at liberation.	No. of specimens	Apparent average growth	Amended average growth
15—19·9 cm.	4	2·9	3·5
20—24·9 »	13	4·2	4·8
25—29·9 »	5	3·4	4·0

The number of individuals is too small to allow us to draw conclusive results from these figures. It appears, as if individuals from 20—24.9 cm. increase more rapidly in growth than individuals from 15—19·9 cm. GARSTANG and KYLE have found, that specimens of a length of 20—30 cm. grow more rapidly than those of a length of 30·5—40 cm.[1])

Rate of growth of Plaice according to Dr. Petersen's Method, compared with the results of the Marking-Experiments.

As stated in the preceding (p. 8 ff.) the growth of the plaice in the Horn Reef Area must according to Dr. PETERSEN's method of measurement be supposed to be 4—8 cm. during the third year of their life. They grow then from ca. 12—14 to ca. 17—20 cm. This is somewhat more than indicated by the marking experiments, still it may be said to be fairly well in correspondance with them. According to the marking experiments, plaice of the recorded size may be supposed to grow ca. 3,5 cm. a year. If after all there be any difference in the growth between marked and unmarked plaice, it is reasonable to suppose the growth of the latter to increase more quickly, as the fish sometimes suffer injury from the labels. The growth of the plaice during its fourth year appear in the Horn Reef Area to amount to ca. 5 8 cm. according to the measurements, but quite satisfactory results have not yet been obtained. According to the marking experiments individuals of ca. 20—25 cm. may be supposed yearly to increase ca. 4·8 cm. This result is again a little below that obtained by the measurements[2]).

The Migration of the Plaice.

An illustration of the migrations of the plaice is represented on the accompanying plates X—XII which give the details with regard to place of liberation and recovery of each plaice. The head of the arrow indicates the place of recovery. The letter by the head indicates: Nation of vessel from which the fish was recovered; Da. meaning Denmark, E. = England, G. = Germany and B. = Belgium. The number at the arrow-head means: Number of months between liberation and recovery. If an 0. is placed by the arrow it indicates, that the individual was recovered in the same month when liberated (April 1903). In some cases, where the letter for want of room has been omitted, Da. should have been put down. For want of space No. 90 has not been laid down from St. 38 but from St. 39, which is situated near St. 38. At several stations a few plaice have been caught inside the figured circles viz.

at St.	38.....	1	individual
- -	39.....	9	—
- -	41.....	4	—
- -	54.....	2	—
- -	59.....	1	—
- -	60.....	2	—
- -	64.....	5	—

[1]) Journal Marine Biol. Assoc. Plymouth VI. 1903.

[2]) By "Thor"s trawling experiments in spring of 1903 a conspicuous size-group of plaice was found, the average size of which was 24—26 cm. south of the Horn Reef and 27—28 cm. north of the Reef. Among several hundred individuals of this group, not a single mature specimen occurred, neither among males nor females. The smallest mature female I ever found at Horn Reef was of 27 cm. The age of the individuals of this group must at least have been 4, possibly 5 years. Here we notice, that neither males nor females of 4 years reach maturity in the Horn Reef Area. The bulk of the plaice developed here, both males and females, are at least 5 years old at first maturity.

1. The Horn Reef Area.

If we regard the migration of plaice from the three stations in the Horn Reef Area: St. 38, St. 39 and St. 41 (Pl. XI—XII) the following features may be noticed. The direction of most arrows marked 0 and 1, indicating plaice recovered in April and May 1903, point inward to the shore. This feature is too conspicuous to allow any doubt. The plaice appear in these spring months to move towards the shore. The arrows marked 2 partly point inwards and partly to offshore grounds, for which reason we can hardly speak of one definite principal route.

The arrows marked 3, 4, 5 and 6, on the contrary, point to offshore grounds. The situation of the places of recapture shows, that the plaice migrate into deeper water during these months or stay there after the migration has taken place.

It is interesting to notice the size of the individuals, which have been measured after recapture in these months:

22 cm.	3 specimens	29 cm.	3 specimens
23 —	1 —	30 —	2 —
27 —	3 —	32 —	2 —
27 —	1 —	33 —	1 —
28 —	2 —	42 —	1 —

From these figures it will be seen that a stock of relatively small individuals together with the larger ones migrates to offshore waters in summer.

The few arrows marked 7 again point towards the shore. The heads of these arrows are all situated in the inshore waters at Fanø. The length of these individuals was 17, 24 and 28 cm. on recapture.

The arrows marked 8 and 9 point offshore. These correspond to plaice recovered in December and January.

Most arrow-heads marked 11, 12, and 13 are again much nearer to the coast than those marked 8 and 9. Here it again appears, that the plaice approach the shore in spring.

2. Off Nissum Fjord—Hanstholm.

In the area Off Nissum Fjord—Hanstholm we notice similar features as at the Horn Reef. Individuals recovered in April and May, 1903, have been caught near the shore, whilst those recovered in July, August and September are generally caught far from the coast in deeper water. Those recovered in April and May of 1904 are again taken nearer the coast than those recovered in the summer of 1903. It will be seen, that the migrations from the stations in this area are much more considerable, on an average, than the migrations from the stations in the Horn Reef Area during the same time.

3. The Skagerak.

In the Skagerak as at the Horn Reef we notice, that the heads marked 0 and 1 generally point inwards to the shore, while those marked 3 and 4 point as a rule offshore. The material is too inconsiderable to allow us to say anything in general regarding the migrations of plaice recovered more than 5 months after liberation. It should be noticed, that the migrations in the Skagerak are on the whole more extensive than those in the Horn Reef Area during the same time.

Migrations of Plaice affected by temperature.

The migrations above-mentioned throw light upon the phenomenon, that the plaice fishery from Esbjerg, which mainly takes place in the Horn Reef area between N. Lat. 55°—56° and inside the 20 fms. line, is typically periodical. It divides into a spring period and an autumn period showing a minimum in winter, and another minimum in the warmest summer time.

In the table on p. 27 a summary is given of the plaice fishery from Esbjerg in each month during the years 1897—1903. It will be seen, that the bulk of plaice in this area are caught in the months April, May and June, just in the months when the plaice move towards the coast. In the months July, August, September and October when the plaice migrate to offshore grounds, or at any rate stay in deeper water and spread over more extensive areas, the catch is greatly reduced.

The summer catch is also reduced by the fact that the mortality among the captured plaice is very great in the warmest summer days. A considerable part of the captured fish die before landed. In autumn there is usually again an increase in the catch, most likely because the plaice again migrate towards the shore. The winter-minimum is probably due to three different causes:

1) bad weather, which prevents the fishermen from fishing;
2) migration of plaice to offshore waters;
3) the fact, that the plaice in winter show a tendency to bury themselves hard into the bottom and consequently are often able to avoid the fishing-gear. (See "Fishing results from the Danish steamer "Thor" in the Kattegat etc." I.)

It is interesting to notice, that the plaice migrate into deeper water just at the warmest and coldest season, whilst they move towards the coast when the water is getting more temperate. To judge from the catch by the Esbjerg fishermen, this occurrence repeats itself so regularly from year to year, that it naturally gives rise to the supposition, that the migrations are affected by the temperature. In the table below an illustration is given of the monthly temperature of the water at the bottom at a certain place in the Horn Reef area: Vyl Lightship. For the sake of comparison has been put down in the adjacent column how many kilo. of plaice have been caught in each month by the Esbjerg fishermen in the Horn Reef area. It must be noted that these fishermen do not carry on any other important fishery than the plaice-fishery.

The table shows, that the result of the winter fishery in January and February has always been very inconsiderable. In March the temperature begins to rise, and at the same time the catch increases. It will be seen, that the March-catch has been greatest in the two years: 1899 and 1903. But these two years are just those with the highest March temperature. The catch culminates in April or May, but falls when the summer heat begins. It is worthy of notice, that the summer catch (in July, August, September) has been greatest in 1902, just in the year when we have had the lowest summer temperature. When the water again becomes more temperate, in October or November, the catch increases again and falls in December, when the winter-temperature begins to make itself felt.

The area where the Danish Plaice-fishery has preponderance over that of foreign Nations.

If we regard the charts over the migrations of the plaice Pl. X—XII it is immediately obvious, that the bulk of the plaice which are caught near the coast or near the Horn Reef, are taken by Danish fishermen, whilst most of those captured at greater distances from the shore are taken by English fishermen. When the marking experiments are carried out on a large scale, the situation of the places of recapture afford without doubt an important help to stating the percentage of fish caught in a certain area by each participating fishing nation.

According to the experiments, which have already been made on the part of Denmark, a line has been drawn on chart V to indicate the outer limit of the area, where the bulk of the marked plaice have been taken by Danish fishermen. Outside this line most of the marked plaice have been taken by English trawlers.

It is worthy of notice that the belt where the Danish fishermen seem to catch the majority of plaice is broadest in the area off Esbjerg, where we have a fishery port.

Date	Kilogram of plaice landed in Esbjerg	Temperature of water Vyl 23 m. mean	lowest	highest	Date	Kilogram of plaice landed in Esbjerg	Temperature of water Vyl 23 m. mean	lowest	highest
1897. January	0	2·0	0·2	4·3	1900. July	139 000	14·2	11·8	17·2
» February	0	÷0·1	÷0·8	1·0	» August	86 000	16·2	14·6	17·3
» March	5500	2·3	0·9	3·7	» September	80 000	15·4	14·9	16·1
» April	332 000	4·5	3·5	5·6	» October	0	13·0	10·8	15·0
» May	261 000	7·5	5·6	8·7	» November	58 000	9·5	7·8	10·9
» June	137 000	10·7	8·7	13·3	» December	32 000	6·8	5·8	7·9
» July	98 000	14·7	12·7	16·0	1901. January	0	3·2	1·9	6·2
» August	66 000	16·7	14·1	17·9	» February	0	2·0	0·8	2·9
» September	28 000	15·5	14.1	17·4	» March	14 000	1·7	0·5	2·2
» October	302 000	12·8	11·7	14·4	» April	199 000	3·9	2·2	6·0
» November	75 000	9·5	6·8	11·8	» May	406 000	6·9	5·8	9·0
» December	0	6·4	5·4	7·3	» June	341 000	10·9	8·6	12·8
1898. January	0	5·8	5·3	6·6	» July	255 000	13·3	11·3	15·9
» February	0	4·8	3·8	5·7	» August	77 000	16·4	13·0	18·1
» March	15 000	3.8	2·9	4·2	» September	88 000	15·0	14·4	16·4
» April	144 000	4·6	3·2	5·8	» October	182 000	13·5	12.1	15·2
» May	259 000	7·8	6·3	9·6	» November	202 000	10·0	7·2	12·1
» June	87 000	11·3	9·8	13·3	» December	1 000	6·0	4·6	7·5
» July	3 000	13.6	12·7	14·1	1902. January	0	4.7	3·8	5·5
» August	57 000	15·3	13·6	16·6	» February	500	2·5	1·3	4·3
» September	99 000	15·6	14·7	16·2	» March	87 000	2·4	1·5	3·5
» October	156 000	12·2	9·4	14·8	» April	434 000	4·5	3·4	5·8
» November	148 000	9·5	8·1	10·3	» May	741 000	6·9	5·8	9·0
» December	0	7·4	6·2	8·4	» June	461 000	11·1	9·2	11·8
1899. January	0	5·6	4·6	6·4	» July	157 000	13·7	11·9	15·2
» February	0	4·9	3·7	5·6	» August	373 000	14·5	13·6	15·3
» March	119 000	4·3	3·3	4·9	» September	179 000	13·7	12·6	14·8
» April	352 000	5·2	4·0	6·8	» October	165 000	10·9	10·3	12·5
» May	322 000	8·1	6·6	9·9	» November	38 000	8·9	6·6	10.4
» June	334 000	11·1	9·4	13·0	» December	300	3·5	2.1	6·2
» July	190 000	14·9	13·6	16·2	1903. January	0	2·8	1·1	4.0
» August	91 000	15·2	14·1	16·3	» February	250	2·6	1·1	3·7
» September	0	15.2	13·7	16·3	» March	193 000	4.2	3.6	5·1
» October	71 000	12·2	10·1	13·6	» April	331 000	5·8	5·2	6·4
» November	0	9·9	8·6	10·8	» May	362 000	8·0	6·5	9·6
» December	0	5·5	2·5	8·7	» June	189 000	10·9	9·6	13·1
1900. January	0	3·3	2·3	4·1	» July	202 000	14·9	13·2	16·1
» February	0	1·9	1·1	2·9	» August	55 000	15·6	15·1	16·1
» March	55 000	2·5	1·8	2·9	» September	49 000	14·8	14·2	15·6
» April	246 000	3·5	2·6	5·1	» October	7 500	12·9	11.6	14·6
» May	354 000	7·0	5·1	8·9	» November	26 000	9·9	7.3	11·7
» June	235 000	10·4	8·6	13·2	» December	0	5·5	4·5	7·2

How to fix the most profitable size limit for the plaice by means of the Marking-experiments.

When marking experiments are carried out on a large scale, we may be able through them to decide, where we can fix the size-limit for the plaice with the greatest profit. This may be done by comparing the value of all marked plaice of a certain size at liberation with the value of the recovered individuals. Let us suppose that we wish to know if the length **X** is a suitable size-limit. We have then to mark and liberate a great number of plaice (**n**), all of the length of **X**. The recovered marked plaice will be:

1) either of a greater value than the **n** individuals of the length **X**.
2) or of the same value.
3) or of a smaller value.

In the first case we must conclude that X is too low a size-limit, in the second case that X is suitable, and in the third case that X is too high a size-limit[1]).

I shall here present a few calculations which will recall the actual circumstances.

I. We liberate 10000 marked plaice in the North Sea, all of a length of 20 cm., of a total weight of 740 kilo. and of a value of 10 Øre per kilo. = 74 Kroner. We will suppose that 3000 specimens are recovered (30%), and that their entire weight will amount to 1000 kilo. of a value of 20 Øre per kilo. = 200 Kroner. From this we would see, that 20 cm. was too low a size-limit. In this case it would be profitable not to catch the plaice till they obtained a larger size.

II. We liberate 10000 marked plaice in the North Sea, all of a length of 40 cm., of a total weight of 6600 kilo., and of a value of 60 Øre per kilo. = 3960 Kroner. We will suppose that 5000 individuals will be recovered (50%), and that their entire weight at recovery is 5000 kilo. of a value of 50 Øre per kilo. = 2500 Kroner. The size-limit of 40 cm. would evidently in this case be too high.

It hardly requires mention, that in carrying out experiments in order to fix the most profitable size-limit it will not be necessary that all the marked plaice should have the same size. I have chosen the uniform size to represent the matter as clearly as possible. Some difficulties will, however, arise from the fact, that the fishermen do not send communications about all the marked plaice recaught to the proper places, but in spite of this I do not doubt that valuable results will be obtained in the direction mentioned: We shall be able to show, that a certain considerable size-limit in certain areas will be advantageous.

Since the Danish marking experiments in the spring of 1903 were made, too short time has elapsed to allow us to draw conclusive results with regard to the right size-limit on the different areas, the number of liberated marked plaice being also in most places too inconsiderable. It is, however, of importance already to compare the weight and the value of all the specimens at liberation with the weight and the value of those recaught. The material for such a comparison is represented on Tables A and B (p. 10—19) and on the Table giving the relation of length to weight (p. 19).

In discussing the value of the specimens at liberation and at recovery, I take a price which nearly corresponds to that obtained by Danish fishermen in later years. It is a matter of course that only an approximate value can be given here. The prices I employ, are as follows:

For plaice below 20 cm. — no value.
- — from 20—24 cm. 10 Øre per kilogram (marketable in England, Germany, Sweden). Weight ca. 2 kilo. per score
- — — 25—29 cm. 20 Øre per kilogram. — 3—4 — —
- — — 30—34 - 40 - - — — 5—7 — —
- — — 35—39 - 60 - - — — 8—12 — —
- — — 40—44 - 60 - - — — 14—18 — —

Experiment No. 2 (Station 38) south of Horn Reef. Details:

a) Liberated: 78 specimens of a length of 14—19 cm., total weight 4000 gram, total value 0 Øre.
Recovered: 4 — — — - 14—19 - — — 194 — — — 0 -
— 3 — — — - 20—24 - — — 267 — — — 3 -
In all recovered: 7 specimens of a weight of 461 gram and a value of 3 Øre.

b) Liberated: 111 specimens of a length of 20—24 cm., total weight ca. 11546 gram, total value 115 Øre.
Recovered: 17 — — — - 25—29 - — — 1924 gram, total value 19 Øre.
— 10 — — — - 25—29 - — — 1783 — — — 36 -
In all recovered: 27 specimens of a weight of 2707 gram and a value of 55 Øre.

[1]) I take it for granted that the labels are sufficiently well attached to the fish. — If the results of the experiments should be exact the interest of the value of the liberated specimens should also be taken into consideration.

c) Liberated: 63 specimens of a length of 25—29 cm., total weight 10,352 gram, total value 207 Øre.
Recovered: 29 — — — - 25—29 - — — 5156 — — — 103 -
d) Liberated: 3 — — — - 30—34 - — — 962 — — — 38 -
None of these specimens recovered.

Result of the whole experiment:

Liberated: 255 specimens of a weight of 26860 gram and a value of ca. 360 Øre.
Recovered: 63 — — — - 9324 — — - — — 161 -

The other marking experiments on the Horn Reef area show similar features as the experiment Nr. 2. If no more specimens than those mentioned were recovered, we could say, that the experiments indicated the Danish size-limit of 25·6 cm. to be too high for the Horn Reef area. A few big marked plaice from these experiments, which may be caught in future, may, however, change the whole calculation, so that nothing definite can as yet be said with regard to this matter.

In the Skagerak, where the plaice grow much faster than in the Horn Reef area, the matter seems to be very different. Here it appears, as represented below, that the value of the already recovered plaice exceeds that of the liberated ones.

Experiments Nr. 6—14 in the Skagerak. Details:

a) Liberated: 42 specimens of a length of 15—19 cm., total weight 2174 gram, total value 0 Øre.
Recovered: 3 — — — - 15—19 - — — 152 — — — 0 -
— 1 — — — - 24 - — — 128 — — — 1 -
— 1 — — — - 28 - — — 210 — — — 4 -
In all recovered: 5 specimens of a total weight of 490 gram and a value of 5 Øre.
b) Liberated: 37 specimens of a length of 20—24 cm., total weight 3663 gram. total value 37 Øre.
Recovered: 7 — — — - 20—24 - — — 767 — — — 8 -
— 3 — — — - 25—29 - — — 566 — — — 11 -
— 1 — — — - 32 - — — 340 — — — 14 -
— 1 — — — - 36 - — — 455 — — — 27 -
In all recovered: 12 specimens of a weight of 2128 gram and a value of 60 Øre.
c) Liberated: 22 specimens of a length of 25—29 cm., total weight 4403 gram, total value 88 Øre.
Recovered: 3 — — — - 25—29 - — — 555 — — — 11 -
— 6 — — — - 30—34 - — — 1748 — — — 69 -
In all recovered: 9 specimens of a total weight of 2303 gram and a value of 80 Øre.
d) Liberated: 16 specimens of a length of 30—34 cm., total weight 5161 gram, total value 206 Øre.
Recovered: 7 — — — - 30—34 - — — 2235 — — — 89 -
— 5 — — — - 35—39 - — — 2125 — — — 128 -
In all recovered: 12 specimens of a weight of 4360 gram and a value of 217 Øre.
e) Liberated: 4 specimens of a length of 35—39 cm., total weight 1830 gram, total value 110 Øre.
Recovered: 3 — — — - 35—40 - — — 1660 — — — 100 -

Results of all the experiments in the Skagerak:

Liberated: 121 specimens of a weight of 17231 gram and a value of c. 441 Øre.
Recovered: 41 — — — - 8706 — — - — - c. 462 -

It is very interesting to see, that in a few stations in the Skagerak the weight of the recovered plaice exceeded that of the liberated ones. In the experiment No. VII (St. 51) 12 marked plaice of a length of 16—32 cm. were liberated, their entire weight being ca. 1500 gram. On June 30, 1904, 7 of these were again recovered. Their entire weight on capture amounted to ca. 1900 gram. In experiment Nr. IX, St. 53, 13 marked plaice of a length of 18—36 cm. were liberated, on April 17, 1903. Their entire weight at liberation was ca. 3100 gram. On June 30, 1904, 12 were again recovered. Their entire weight was then ca. 3500 gram.

In this connection I wish to call attention to three marking experiments from the "Thor" in the north-western Kattegat in the spring of 1904. Though only a short time has passed since these experiments took place, we find that the value of the specimens recovered up to the end of October, 1904, exceeds that of all the liberated ones, and that the weight of the recovered specimens is nearly equal to that of all the liberated ones.

I. Læsø Rende. 16 meters. March. 7. 1904. Details:

a) Liberated: 18 specimens of a length of 20—24 cm., total weight 2124 gram, total value 21 Øre.
Recovered: 6 — — — - 20—24 - — — 831 — — — 8 -
— 6 — — — - 25—29 - — — 1135 — — — 23 -
— 2 — — — - 30 - — — 524 — — — 21 -
In all recovered: 14 specimens of a weight of 2490 gram and a value of 52 Øre.

b) Liberated: 12 specimens of a length of 25—29 cm., total weight 2125 gram, total value 43 Øre.
Recovered: 4 — — — - 25—29 - — — 759 — — — 15 . -
2 — — — - 30 - — — 524 — — — 21 -
In all recovered: 6 specimens of a weight of 1283 gram and a value of 36 Øre.

Results of the whole experiment:

Liberated: 30 specimens of a weight of 4250 gram and a value of c. 64 Øre.
Recovered: 20 — (66·7 %) of a weight of 3773 gram and a value of c. 88 Øre.
(19 specimens recaptured by Danish fishermen, 1 by Swedish.)

II and III. Aalbæk Bay. 14 and 19 meters. March. 7 and 14. 1904.

a) Liberated: 17 specimens of a length of 20—24 cm., total weight 2004 gram, total value 20 Øre.
Recovered: 8 — — — - 20—24 - — — 989 — — — 10 -
— 5 — — — - 25—29 - — — 870 — — — 17 -
— 1 — — — - 30 - — — 262 — — — 10 -
In all recovered: 14 specimens of a total weight of 2121 gram and a total value of 37 Øre.

b) Liberated: 39 specimens of a length of 25—29 cm., total weight 6904 gram, total value 138 Øre.
Recovered: 30 — — — - 25—29 - — — 5719 — — — 114 -
— 2 — — — - 30—4 - — — 579 — — — 23 -
In all recovered: 32 specimens of a weight of 6298 gram and a value of 137 Øre.

c) Liberated: 4 specimens of a length of 30—34 cm., total weight 1259 gram; total value 50 Øre.
Recovered: 4 — — — - 30—34 - — — 1314 — — — 53 -

Summary result of II and III:

Liberated: 60 specimens, total weight 10203 gram, total value c. 208 Øre.
Recovered: 50 — (83·3 %), weight 9733 gram, total value c. 227 Øre.
(48 specimens recaptured by Danish fishermen, 2 by Swedish fishermen.)

If renewed experiments with greater number of individuals should give similar results to those mentioned here we are led to suppose, that it will pay to raise the size-limit for the plaice in the Skagerak and the northern Kattegat. A size-limit of ca. 30 cm. would not seem to be too high here. There is, of course, a possibility, that when we have raised the size-limit, and when — in consequence of that — the number of grown up plaice will have increased, so there will at the same time be less food for the smaller ones and these will grow slower. Consequently, when we have raised the size-limit, we shall have to investigate whether the rate of growth of the smaller plaice has changed or not.

IV. The state of the Danish plaice fishery.

The Danish fishery law of 1888 prohibits sale of plaice of less than 8 Danish inches from the tip of the snout to the base of the caudal fin, which corresponds to a total length of ca. 9¾ inches or about 25·6 cm. The landing of the undersized plaice is on the contrary not prohibited. These are mostly used at home by the fishermen. To a small degree they are exported or subject to unlawful sale at home. The Danish statistics only comprise the fish which have exceeded the size-limit.

The prohibition of sale of undersized fish has undoubtedly the effect, that far less of these are landed than would otherwise be the case. In order to prevent the destruction of undersized fish more effectually a proposal has been inserted in the new fishery bill, introduced into the Danish Rigsdag in 1904, to the effect that the landing of undersized fish should also be prohibited, except from the Baltic

and in certain places on the North Sea, where special regard has been taken of the small class of fishermen. In this bill the size-limit for the plaice has been fixed to 25 cm. In this connection I wish to remark, that undersized plaice may be liberated in quite viable condition practically always when caught in the "Snurrevaad", which is the most important of the Danish fishing-gear used for the plaice fishery.

The Danish fishery-statistics are published in the Danish fishery-reports (Fiskeri-Beretninger) edited by C. F. Drechsel. During the last few years C. J. Hansen, acting Captain in the Danish Navy, has been charged by "Kommissionen for Havundersøgelser" to provide more detailed statistical information regarding the plaice-fishery than that which might immediately be derived from the fishery-reports. In working out this chapter I have in several places availed myself of Capt. Hansen's results.

Size of the marketable plaice on our various fishing grounds.

In order to obtain a general survey regarding the size of plaice in the Danish seas, two factors must be taken into consideration; in the first place, that the average-size of the plaice normally increases with the depth, secondly, that the individual maximum size is very different in our various seas. It is evident, that the plaice normally is able to obtain a more considerable size in the North-Sea and Skagerak than in the Kattegat. In the Kattegat they are again able to reach a larger size than in the Belt-sea, and in the Belt-sea they may again obtain a more considerable size than in the Baltic, properly so called.

The Horn Reef Area.

To the "Horn Reef Area" is here reckoned the grounds around Horn Reef from 0—40 m. and between N. Lat. 55°—56°. This forms a part of what the Englishmen call the "Eastern Grounds", from which a great mass of small plaice below 25 cm. is brought to England. Almost all the plaice caught by Danish fishermen in the Horn Reef area are immature fish above 25 cm., which are landed in Esbjerg.

The table below offers a survey of the size of the plaice fished in the Horn Reef area. The table, which is an extract of journals of the Danish cutters, has been worked out by Captain C. J. Hansen. Of the landed plaice only 688 scores or ca. 0·5 % were of so considerable a weight (8—8·5 kilo.) that the majority of these may be supposed to have been mature. The average weight per score of all the plaice amounts to ca. 5·1 Kg.

Size of marketable plaice in the Horn Reef Area.

Year	3 Kg.	3·5 Kg.	4 Kg.	4·5 Kg.	5 Kg.	5·5 Kg.	6 Kg.	6·5 Kg.	7 Kg.	7·5 Kg.	8 Kg.	8·5 Kg.	9 Kg.	Total No. of scores forming the basis of the calculation	Average weight per score
1898	....	....	.....	.....	1550	350	735	....	...	....	...	...	...	2635	5·3
1899	2385	3094	12380	16023	11276	2813	2299	655	870	175	...	...	...	51970	4·6
1901	....	....	.....	4875	8770	4850	3440	970	200	870	...	330	...	24305	5·2
1902	....	350	496	5513	29838	10519	8269	7290	919	335	150	208	...	63887	5·4

The Hanstholm-Søndervig Area.

To the Hanstholm-Søndervig area is here reckoned the grounds off the west-coast of Jutland, between 56—57°10′ N. Lat. and from 0—50 meters depth.

The plaice caught in this area are, on an average, of a more considerable size than those caught in the Horn Reef area. As it also may be reckoned here that the limit between mature and immature plaice is almost at 8 kilo. per score (a size which corresponds to an individual length of 34 cm.) it will be seen from the table below that proportionally many more mature plaice are caught in this area than at the Horn Reef.

Size of marketable plaice in the Hanstholm-Søndervig Area. (According to C. J. Hansen.)

Year	4 Kg.	4·5 Kg.	5 Kg.	5·5 Kg.	6 Kg.	6·5 Kg.	7 Kg.	7·5 Kg.	8 Kg.	8·5 Kg.	9 Kg.	9·5 Kg.	10 Kg.	10·5 Kg.	11 Kg.	11·5 Kg.	12 Kg.	12·5 Kg.	13 Kg.	13·5 Kg.	14 Kg.	No. of scores forming the basis of the calculation	Average weight per score
1900 ...	...	...	....	....	672	....	...	....	150	11	...	166	...	...	30	92	..	..	..	..	50	1171	7·7
1902 ...	260	...	1260	2555	2961	4258	745	2142	458	674	393	212	377	278	..	..	35	..	..	..	..	16608	6·6

The Skagerak.

In the Skagerak the plaice-fishery is carried on at all depths between 0 and 80 metres. The plaice captured at depths between 0 and 15 metres are generally of a rather small size: ca. 4—5 kilo. a score. In the deeper water of the Skagerak, from ca. 40—80 metres, the plaice has usually a weight from ca. 8—15 kilo. a score. As it may be reckoned, that the size of 8 kilo. a score in its broad features forms the limit between the mature and immature plaice, also in the Skagerak, it will be seen, that almost half the number of the plaice set forth in the table below, must be supposed to have been immature.

Size of marketable plaice in the Skagerak.

Year	4 Kg.	4·5 Kg.	5 Kg.	5·5 Kg.	6 Kg.	6·5 Kg.	7 Kg.	7·5 Kg.	8 Kg.	8·5 Kg.	9 Kg.	9·5 Kg.	10 Kg.	10·5 Kg.	11 Kg.	11·5 Kg.	12 Kg.	12·5 Kg.	13 Kg.	13·5 Kg.	14 Kg.	14·5 Kg.	15 Kg.	15·5 Kg.	16 Kg.	Total No. of scores forming the basis of the calculation	Average weight per score in Kilogr.
1897[1]) ..	..	...	114	....	131	193	676	1242	2088	1330	3093	...	4087	24	1765	106	1192	512	732	..	487	..	430	..	..	18202	9·8
1898[1]) ..	..	...	...	....	1080	1728	2071	2640	1569	1312	1548	335	1156	25	457	..	380	70	564	..	...	..	...	..	..	14935	8·0
1899[1]) ..	..	...	577	....	1009	1593	1961	1429	2229	913	1689	...	1529	..	1270	55	416	415	227	..	128	..	50	..	..	15490	8·4

The Limfjord.

With regard to the plaice in the Limfjord see "Report of the Danish Biol. Station VI" and the Danish fishery Reports. The average weight per score amounts to 4—5 Kg.

The Kattegat.

If we divide the Kattegat by a line Hals-Anholt Knob we may roughly calculate that one half of the plaice is caught north and the other half south of this line. The majority of the plaice caught north of this line are immature fish, whereas the majority of those caught south of the line are mature fish.

Regarding the Kattegat, considerable material has been provided, which shows the weight of plaice per score for the years 1897—1902. It is of great interest to notice here that the average weight has kept somewhat constant during the years 1897—1902, not only for the whole Kattegat, but also for each of the principal fishing grounds.

Size of marketable plaice in the Kattegat.

Year	3 Kg.	3·5 Kg.	4 Kg.	4·5 Kg.	5 Kg.	5·5 Kg.	6 Kg.	6·5 Kg.	7 Kg.	7·5 Kg.	8 Kg.	8·5 Kg.	9 Kg.	9·5 Kg.	10 Kg.	10·5 Kg.	11 Kg.
1897[1])	..	...	2826	23339	28716	20307	29673	9499	13701	8918	7270	2750	2839	777	1891	96	652
1897[2])	..	...	3429	21200	30180	22508	30140	11314	15050	10485	10123	4624	4230	1061	2553	175	911
1898[1])	..	...	....	7150	12510	17419	21470	15404	19164	12857	8735	3587	2842	733	1492	...	486
1898[2])	..	...	82	8303	13663	20850	27552	18461	23532	13816	10585	4369	3364	951	2082	...	845
1899[1])	..	...	1325	4722	9186	8982	11506	11119	12787	8278	5786	2711	2228	516	1087	...	328
1899[2])	..	655	1818	5786	10866	8459	13783	11893	11760	7389	5954	3325	2429	576	1363	70	58
1900[1])	..	280	698	2290	7305	5958	12726	8472	8161	4884	2559	1293	1008	157	470	96	69
1901[2])	..	1135	957	1225	8343	7262	9183	4205	4036	2105	3365	1655	953	67	131	135	25
1902[2])	..	...	739	3860	13164	11325	14536	7618	8219	5779	2876	1402	2168	428	1134	278	1097

[1]) According to C. F. Drechsel's Fiskeri-Beretning. [2]) According to C. J. Hansen.

Size of marketable plaice in the Kattegat.

Year	11·5 Kg.	12 Kg.	12·5 Kg.	13 Kg.	13·5 Kg.	14 Kg.	14·5 Kg.	15 Kg.	15·5 Kg.	16 Kg.	16·5 Kg.	17 Kg.	17·5 Kg.	18 Kg.	18·5 Kg.	19 Kg.	Total No. of scores forming the basis of the calculation	Average weight per score in Kilogr.
1897 [1]	63	160	155	...	122	130	...	394	...	117	..	..	..	..	..	..	154 395	6·0
1897 [2]	180	160	220	...	123	130	...	207	217	29	..	..	6	..	..	..	169 255	6·2
1898 [1]	208	329	293	614	86	578	...	110	...	25	..	..	37	..	..	23	126 152	6·9
1898 [2]	351	310	220	593	38	118	...	85	108	50	..	37	..	..	23	..	150 388	6·6
1899 [1]	168	9	20	...	...	...	...	...	...	28	..	..	5	..	..	..	80 791	6·5
1899 [2]	109	9	20	...	...	...	...	...	...	28	..	..	5	..	..	..	86 355	6·4
1900 [1]	...	74	...	110	...	69	...	53	...	...	..	..	1	..	..	..	56 733	6·4
1901 [2]	...	...	...	...	...	...	...	...	...	...	..	..	..	..	..	..	44 782	6·1
1902 [2]	475	910	...	355	200	...	...	240	...	...	..	..	..	..	..	..	76 803	6·5

Size of marketable plaice in different parts of the Kattegat.

Area	Year	No. of scores forming the basis of the calculation	Average weight per score in kilogram
Northern Kattegat	1897 [2]	31715	6·3
—	1898 [2]	41016	6·4
—	1899 [2]	32891	6·2
—	1900 [1]	16108	6·4
—	1901 [2]	7628	5·8
—	1902 [2]	34294	5·9
Læsø Rende (W. of Læsø)	1897 [2]	34196	5·5
—	1898 [2]	39630	5·8
—	1899 [2]	6283	4·9
—	1900 [1]	4421	5·7
—	1901 [2]	2560	5·2
—	1902 [2]	5907	5·1
E. of Læsø	1897 [2]	16250	6·8
—	1898 [2]	20254	7·2
—	1899 [2]	9423	6·7
—	1900 [1]	2686	7·0
—	1901 [2]	3473	6·6
—	1902 [2]	9113	6·3
Aalborg Bay	1897 [2]	73622	5·9
—	1898 [2]	34837	6·7
—	1899 [2]	28877	6·5
—	1900 [1]	20636	6·0
—	1901 [2]	25264	6·1
—	1902 [2]	11052	6·5
Kobberground	1897 [1]	6408	7·6
—	1898 [1]	7463	8·6
—	1899 [1]	3245	c. 7·3
—	1900 [1]	1891	7·1
N. of Anholt	1897 [2]	6340	9·1
—	1898 [2]	6765	9·9
—	1899 [2]	3678	8·6
—	1901 [2]	1791	8·5
—	1902 [2]	6752	9·0
Off Fornæs	1897 [1]	1383	c. 6·4
—	1898 [1]	1838	7·0
—	1899 [1]	4671	c. 6·6
—	1900 [1]	6287	c. 6·3

[1]) According to C. F. Drechsel's Fiskeri-Beretning. [2]) According to C. J. Hansen.

The Belt Sea.

(Northern limit: Sjællands Odde Hjælm. Eastern limit: Gedser Darsserort). In the Belt Sea the plaice is subject to a rather considerable shore fishery, but there are only few fishing grounds for the Snurrevaads-fishery. The two most important of these grounds are situated south of Sprogø at a depth of ca. 20 m. and south of Ærø at a depth of ca. 16—20 m. A table indicating the size of the plaice on these grounds has been worked out by Captain C. J. Hansen and is set forth below.

Practically all marketable plaice landed from the Belt Sea are mature fish.

Size of marketable plaice in the Great Belt.

Year	3 Kg.	3·5 Kg.	4 Kg.	4·5 Kg.	5 Kg.	5·5 Kg.	6 Kg.	Total No. of scores forming the basis of the calculation	Average weight per score in kilogram
1899.....	...	...	....	1513	1997	....	...	3510	4.8
1902.....	...	...	1045	2807	4747	1830	150	10579	4·9

Size of marketable plaice south of Ærø.

Year	3 Kg.	3·5 Kg.	4 Kg.	4·5 Kg.	5 Kg.	5·5 Kg.	6 Kg.	Total No. of scores forming the basis of the calculation	Average weight per score in kilogram
1901.....	...	....	....	375	5512	....	...	5887	5·0
1902.....	227	1948	2349	5551	5154	1950	757	16936	4·6

The Baltic.

In the Baltic, properly so called, the Danish plaice-fishery is of slight importance. Only a few thousand scores of a weight of 3—5 kilo. per score are landed by Danish fishermen. They have all obtained maturity long before they pass the Danish size-limit.

The state of the Danish Plaice-fishery in our various seas.

Till 1872 the Danish plaice-fishery was entirely a coast-fishery, in which only small open boats were engaged. In the period just before 1872 the most important gears for the plaice-fishery were gill-nets, ground-seines, used from the shore, and hooks. What was caught with these gears could not much more than satisfy the demand at home, which at that time was far less than at present. The period from 1872 to 1880 indicates a new era in the history of the Danish plaice-fishery on account of two facts, firstly because the fishermen now began to employ in the open sea a sort of plaice-seine, the "snurrevaad", which hitherto had only been known from the Limfjord, and secondly because they began to use large decked vessels[1]). The first decked vessel, destined for the fishery far from the shore, was procured by an Esbjerg fisherman in 1872, and as it proved to be practical others were soon introduced[2]).

In the beginning the decked vessels were used for the line-fishery, but it became evident ere long that the fishery with the snurrevaad for plaice was more profitable than the line-fishery for cod and haddock. In 1880 the fishermen from Frederikshavn began to use the snurrevaad from large decked vessels, provided with a pond: the cutters, and soon this "Kutterfiskeri" became an extensive trade. In consequence of the development of the fishery the area in which the plaice-fishery was carried on was

[1]) About the Danish fishing-vessels and fishing-gears see: C. F. Drechsel: "Oversigt over vore Saltvandsfiskerier". København 1890.

[2]) See A. Bloch: Nordisk Tidsskrift for Fiskeri. VII. Aargang. København 1882.

much enlarged. From this time the plaice-fishery was carried on, not only in shallow water near the shore, but also far from the coast in places, where the fish was most abundant. To what degree this cutter-fishery has been developed and encouraged in our seas, will be seen from the table below, stating the number of fishing-cutters destined for the plaice-fishery from Frederikshavn and Esbjerg, the two most important ports for the Danish plaice-fishery.

Epoch	No. of cutters destined for the plaice-fishery	
	Frederikshavn	Esbjerg
1880	2	0
1885	36	0
1886	39	0
1887	56	0
1888	70	0
1889	86	0
1890	c. 100	0
1891	88	0
1892	99	0
1893	101	1
1894	99	4
1895	99	17
1896	98	26
1897	113	32
1898	120	34
1899	140	46
1900	153	48
1901	147	47
1902	c. 140	49
1903	c. 140	54

Under the heading Frederikshavn, all the cutters from the western Kattegat, north of the Limfjord, are included. For some of the years a few welled carriers (Kvaser) are probably included.

Another series of figures illustrating the development, which has taken place with regard to our plaice-fishery, is set forth below according to the Danish fishery-report for 1902—1903 (almost all the Danish fishing vessels above 15 tons are engaged in the plaice-fishery):

Year	No. of Danish fishing vessels above 15 tons brutto	Total tonnage
1885	117	2·570
1889	195	4·400
1893	262	6·600
1897	280	7·400
1901	366	10·700
1903	374	11·200
1904	392	11·470

Even the figures set forth here do not give adequate information of the development, which has taken place in our plaice-fishery during the last 20 to 30 years. Contemporaneously with the great increase in the number of the cutters, the technique of machinery has played a great role in many ways and increased the fishing power of the cutters to a very high degree. I shall here mention 3 factors, which have all highly tended to raise the intensity with which the plaice-fishery has been carried on.

I. Introduction of motor-power for the winch. From the years 1889—1896 motor-power for the winch was introduced in almost all our cutters. In this way the employment of much longer lines was made possible together with the application of greater weight to the seines; also, the rapidity of making the hauls became greater. Thus the fishing-area was much enlarged, as the "snurrevaad" was now used at all depths up to ca. 40 fms., while the fishermen in the period from 1872—1889 had almost entirely restricted themselves to depths of less than 20 fathoms. In Frederikshavn the majority of the cutters were provided with motor-power for the winch in the year 1890. In Esbjerg the motor-power was not introduced till 1895—1896 in the cutters.

II. The introduction of a screw in the cutters. While the cutters were formerly dependant on the wind as moving power, the fishermen began in the nineties to introduce an auxiliary-screw, moved by a motor, which gave the cutters a speed from 2 to 5 miles per hour. Thus a number of difficulties were removed, which were caused by the fact that the cutters were unable to sail to or from the fishing grounds on account of calms. The introduction of the auxiliary-screw took place very quickly. In Frederikshavn and Esbjerg it was introduced in the majority of the cutters during the years from 1898—1901. A few attempts with auxiliary-screw were made a few years earlier.

III. Introduction of motors in the small boats belonging to the cutters. While the small boat belonging to each cutter had formerly to be rowed out from the anchored vessel, it is now moved by a motor, which partly saves time and partly causes, that the net may now be shot in rougher weather than was formerly the case. During the years 1902—1903 motors have been introduced in almost all the small boats belonging to the cutters in Frederikshavn and Esbjerg.

It ts not only our largest fishing-vessels, the cutters, which have more and more adopted the use of motor-power. Many smaller open boats, from which the snurrevaad-fishery entirely or partly is carried on, have during the last years been provided with motors.

Contemporaneously with the great increase in the number of fishing vessels there has also been an increase in the number of fishing gears. In 1885 the number of plaice seines ("snurrevaad") was 418 and the number of gill-nets 31439 for the seas east of the Skagen [1]). In the years 1902—1903 the numbers had increased to c. 1100 and c. 39000 respectively [2]). With regard to the Limfjord we possess statistics, stating the number of gill-nets and the number of snurrevaad for a long series of years. In the Limfjord the increase in the number of gill-nets has been much greater than in the number of "snurrevaad" since 1862 (see p. 49).

For the seas beyond the Skagen the number of the principal fishing gears for the plaice-fishery has been stated on p. 37.

From the facts stated here it will be understood, that the intensity with which the plaice-fishery is carried on from Danish side has greatly increased during the years from 1872—1904. In reality the intensity of fishing has become several times greater at the end than at the beginning of this period.

It can be said with regard to all the seas around Denmark, that the intensity with which the plaice-fishery is carried on has increased exceedingly since 1872. The fishing-grounds of the Kattegat, the Skagerak, and the Horn Reef area have especially been subject to a very intense snurrevaad-fishery.

In our neighbouring countries a strong development of the plaice-fishery has also taken place during the last 30 years. The English plaice-fishery is predominating over the main part of the

[1]) Th. Kornerup: Fiskeri-Statistik III. Fiskeritidende 1888, p. 234 etc..

[2]) Fiskeri-Beretning for 1902—1903 and 1903—1904. (The quoted figures are rather defective.)

Danish fishing-gears for the plaice-fishery from places on the North Sea and the Skagerak.

Year	No. of ground-seines used from the shore	No. of gill-nets	No. of plaice seines ("snurrevaad")
1895	119	1284	485
1896	80	1369	454
1897	87	1373	680
1898	76	1285	578
1899	81	1746	724
1900	93	1706	559
1901	93	1704	574
1902	102	1343	565
1903	104	3253	711

North Sea. The Danish plaice-fishery has only maintained its predominance in the Skagerak, the Kattegat and the Belts. It may be reckoned, that the yield of the Danish plaice-fishery in these seas is ca. 7 times larger than the Swedish [1]). How much the yield of the German plaice-fishery in these seas amounts to, is not known. In the Baltic the German plaice-fishery has by far preponderance over the Danish and the Swedish [2]).

1. The Danish plaice-fishery in the North Sea.

The Danish plaice-fishery in the North Sea was not of much importance, till the fishermen began to employ the "snurrevaad" from the large decked boats in the eighties. At the beginning it was only cutters from the Kattegat and the Limfjord, which carried on this fishery in the North Sea, but when these cutters at the end of the eighties began to land their catch in Esbjerg, the "snurrevaad" was also soon introduced here.

The yield of the plaice-fishery from vessels belonging to Esbjerg.

Year	No of decked vessels at the beginning of the year	No. of decked vessels provided with motor for the winch	Average tonnage of the decked vessels, tons brutto	No. of kilogram of plaice	Value in Kroner
1887	?	0	?	72,000	5,800
1891	c. 18	1?	?	461,000	37,100
1892	c. 18	1?	?	942,000	70,800
1893	c. 18	1?	?	1,437,000	97,800
1894	18	1	12·7	1,154,000	102,400
1895	24	5	14·7	586,000	73,100
1896	30	19	15·9	1,241,000	132,900
1897	34	32	24·3	1,305,000	169,300
1898	35	34	30·6	1,028,000	193,600
1899	46	46	31·6	1,813,000	294,700
1900	48	48	32·8	1,524,000	306,700
1901	48	48	35·5	1,847,000	367,900
1902	50	50	35·8	2,648,000	474,400
1903	55	55	37·6	1,512,000	397,800

[1]) For the yield of the Swedish plaice-fishery see: F. Trybom: Atgärder för Fiskerinäringen i Sverige Aar 1902. Stockholm 1904.

[2]) With regard to the German plaice-fishery in the Baltic see for inst. Mittheilungen des Deutschen Seefischerei-Vereins. No. 7—8. 1903.

As more than half of the Danish plaice-fishery in the North Sea at present is carried on by fishermen from Esbjerg, it is of peculiar interest to follow the development of this fishery with regard to Esbjerg.

The plaice-fishery from Esbjerg was before 1887 of quite secondary importance. The "snurrevaad" was not yet introduced. The main fishery from Esbjerg was at that time a line-fishery for haddock. Whilst the yield of the plaice-fishery in 1887 for Esbjerg and Hjerting only amounted to ca. 72,000 kilo., the catch of haddock amounted to ca. 908,000 kilo., and the catch of cod to ca. 116,000 kilo. It was however soon evident, that the "snurrevaad-fishery" was able to overcome the line-fishery with regard to Esbjerg. In 1895 the yield of the plaice-fishery was 586,000 kilo., of the haddock-fishery 98,000 and of the cod-fishery ca. 6000 kilo. A survey of the development of the plaice-fishery from Esbjerg for the years 1887—1903 is set forth in the table above according to the Danish fishery-reports. For the years 1887—1894 the yield from the little fishing village Hjerting is comprised, but as only a quite insignificant plaice-fishery from this village was carried on during these years, it hardly counts in the total yield. For the year 1891 the report only states the yield for the period from March 1st—December 31st. This is however of slight importance, as only very small quantities of plaice are caught from Esbjerg in the winter months (see p. 27). Of more importance than the features stated here is the fact, that the fish landed in Esbjerg by cutters from the seas inside the Skagen or the Limfjord is comprised in the yield put down for the years 1891—1896. This amounts certainly to considerably less than the amount fished by the Esbjerg vessels themselves, but it does nevertheless render the comparison between the quoted years and the following ones difficult. For the years 1897—1903 this yield is deducted. It is indicated in the fishery-reports as set forth below.

Plaice landed in Esbjerg from Cutters belonging to the Kattegat ports or to the Limfjord.

Year	No. of kilogram	Value in Kroner
1897	154,000	19,000
1898	22,000	4,200
1899	190,000	28,700
1900	698,000	132,600
1901	693,000	128,000
1902	1,596,000	257,100
1903	828,000	211,000

Another fact, which has to be taken into consideration, is, that the table does not state, how much the Esbjerg cutters directly take to the market in Germany. The amount of this is about as follows:

Year	Kilogram	Value in Kroner
1896	85,000	15,000
1897	125,000	26,000
1898	150,000 [1])	30,000
1899	180,000 [1])	40,000
1900	200,000 [1])	60,000
1901	200,000 [1])	60,000
1902	200,000 [1])	65,000
1903	200,000 [1])	70,000

[1]) Calculated by the author.

Contemporaneously with the increase and improvement of the fishing-material, the yield in kilo. and especially in Kroner has grown exceedingly. But while the intensity, with which the fishing is carried on, has augmented rather evenly, the yield of the fishery in kilo. shows considerable fluctuations. These fluctuations may usually be ascribed to physical factors, and perhaps partly to migration of the plaice. The different years may be more or less favourable with regard to the development of the fry and also to the growth of young and grown-up plaice.

The great increase both in quantity and value of the landed plaice suggests, that the fishery in Esbjerg on the whole is in progress, and that the development since 1887 has taken a favourable turn. The North Sea is evidently a sea, from which the Danish fishermen ought to fetch far greater quantities ot fish than is now the case. In this connection I wish to remark, that it has already become a general complaint, that the fishery harbour in Esbjerg, built in 1900—1901, is too small.

In the Hanstholm-Søndervig area the Danish plaice-fishery is of far less importance than in the Horn Reef area. Our plaice-fishery has only predominance here in a narrow shore belt (east of the dotted line on Pl. V). The most important ports for the plaice-fishery in this area are: 1) Frederikshavn, 2) Esbjerg, 3) small ports on the Limfjord.

The total yield of the Danish plaice-fishery in the North Sea, exclusive of the Skagerak, can at present not be stated with any certainty. When the Skagerak however is included, the yield may be given approximately. According to the Danish fishery-reports the yield appears as follows:

a) Plaice landed on the west-coast of Jutland.

It has not been possible to produce statistical information regarding the yield of the North Sea fishery for the years 1888—1890. The year 1891 only comprises the period from March 1st—December 31st. The main of the yield has been stated in Danish lbs. in the fishery-reports, while the lesser part has been put down as "number of specimens". In converting the total yield into kilo. is has been reckoned, that the weight each amounts to ca. 1/3 kilo. (see p. 32).

Plaice from the North Sea and the Skagerak landed on the west coast of Jutland.

Year	Statement about number of specimens	Statement about Danish lbs	Yield in kilogram, approximately	Value in Kroner
1887	285,000	2,310,120	1,150,000	143,000
1891	5,690	1,588,641	796,000	79,000
1892	24,930	2,178,447	1,098,000	99,000
1893	56,908	3,089,855	1,564,000	116,000
1894	1,350,000	2,608,028	1,754,000	142,000
1895	262,500	1,606,906	891,000	109,000
1896	83,740	2,939,916	1,498,000	170,000
1897	81,520	1,907,463	981,000	202,000
1898	167,760	2,574,462	1,243,000	239,000
1899	171,720	4,325,988	2,220,000	348,000
1900	95,580	4,615,065	2,339,000	460,000
1901	132,880	5,146,471	2,618,000	515,000
1902	354.220	9,010,025	4,623,000	809,000
1903	295,310	4,674,746	2,436,000	637,000

b) Plaice from the North Sea and the Skagerak landed in the Kattegat ports from the Kattegat cutters.

How this yield has been calculated is set forth on p. 53 ff. As the main part of this yield undoubtfully originates from the Skagerak, the weight per score has here been calculated to amount to 8 kilo. (see p. 32). For the year 1898 it is only the yield of the cutters from the Frederikshavn district, which

has been stated. It appears, however, as if the Kattegat-cutters from other places only have taken part in the fishery beyond the Skagen to a very slight degree during this year, when the Kattegat-fishery was very considerable (see the Danish fishery-reports for 1898—99 p. 55 and 1899—1900 p. 76—77).

Year	No. of Kattegat-Cutters fishing in the North-Sea or the Skagerak	No. of scores approximately	No. of kilogram approximately	Value in Kroner
1895	129	169,000	1,352,000	416,000
1896	76	118,000	944,000	355,000
1897	100	120,000	960,000	303,000
1898	c. 40	73,000	584,000	173,000
1899	103	233,000	1,864,000	359,000
1900	74	40,000	320,000	101,000
1901	.....	115,000	920,000	302,000
1902	c. 114	192,000	1,536,000	384,000
1903		179,000	1,432,000	484,000

c) Plaice from the North Sea and the Skagerak landed in Germany by Danish welled carriers (Kvaser).

(This yield is stated on p. 38).

Total yield of the Danish plaice-fishery in the North Sea (including the Skagerak).

The figures below do not comprise the capture taken directly to England or to Copenhagen from the North Sea and Skagerak by 1 or 2 Danish steam-trawlers. Neither is the catch brought into harbours on the Limfjord by the Limfjord cutters from west of Løgstør comprised. None of these factors are of much importance regarding the entire yield.

Year	No. of kilogram	Value in Kroner
1895	2,243,000	525,000
1896	2,527,000	540,000
1897	2,066,000	531,000
1898	1,977,000	442,000
1899	4,264,000	747,000
1900	2,859,000	621,000
1901	3,738,000	877,000
1902	6,359,000	1,258,000
1903	4,068,000	1,191,000

It will be seen from the figures stated here, that the Danish plaice-fishery in the seas beyond the Skagen has developed with great rapidity. For the period from 1895—99 the average yield has been 2,600,000 kilo. per year against 4,250,000 kilo for the years 1900—1903.

The statistical dates concerning the Danish plaice-fishery in the North Sea do not offer any information with regard to the question, whether the stock of plaice at present is different from what it was formerly. On account of other facts we have, however, every reason to believe, that the stock of large mature plaice has been depleted very much by the intense fishing.

That the very large plaice formerly were more abundant in the area around the Horn Reef than at present, seems without doubt according to the many statements at hand from people, who 15—20 years ago, or still earlier, took part in the fishery themselves or at any rate were spectators.

Such large mature plaice surpassing 40 à 50 cm., are in Denmark called by a special name "Hanser", "Præsteflyndre" or "Præsteskuld"[1]). It is a fact, that such "Hanser" almost never appear around Horn Reef at present. Among several thousands of plaice caught at Horn Reef by the "Thor" there was none above 40 cm. It is likewise seen by the table indicating the weight per score of plaice at Horn Reef for the years 1897—1902 (p. 31), that such big plaice practically have been wanting entirely. Now we have at hand a series of concordant information, that such "Hanser" formerly were rather common. Of such information I shall here call attention to the following:

"Thor's" sailing master, Mr. S. JØRGENSEN communicates the following:

A. "In the years 1884 and 1885 I trawled "Hanser" with an Antwerp cutter on the rising ground Horn Reef. L. S. bearing N. E. to S. E. in 15 to 17 fms. When we got 10 à 15 baskets of fish in an 8 hours' haul 2 would contain "Hanser". The rest consisted of better or smaller fish. Later in spring we got around the Reef, and even on the Reef in 3 fms.' water, a number of "Hanser" corresponding to that mentioned above, but the thicker and better fish were also here in majority".

B. "In 1892, when I commanded the steam-trawler Helene of Antwerp, I got in June 8 à 9 baskets of plaice in 4 hour's hauls on the fishing-ground 12 à 13 miles N. N. E. from Horn Reef L. S. in 12 fms., but then we did not get more than 5 à 6 "Hanser" in each haul."

Mr. TARBEN TARBENSEN communicates, that when he fished for plaice with hooks on the area N. of Horn Reef in the beginning of the seventies he very often caught plaice of a weight from 2—4 kilo. each. He remembers that he once had a catch of 50 scores of a weight of ca. 50 kilo. per score, according to his estimate. They were sold at a price of 1 Kr 33 Øre per score.

Mr. MARIUS VIBÆK M. A. communicates, that he has several times seen 1 à 2 scores of large plaice in the beginning of the eighties among fishes, brought in a carriage into the country N. of Skallingen and caught on lines near the shore off Blaavand Point. According to his estimate the plaice had a length of ca. 60—70 cm.

Miss L. DAHL, who lived in Hjerting, N. of Esbjerg, in 1849—50 remembers, that "Præsteskuld" of a length of more than 1·5 feet, were caught close to the shore.

There is, however, no reason to think, that it should be a local phenomenon, holding good only with regard to the Horn Reef area, that the number of large plaice decrease so very much. On the contrary, there is every reason to believe, that this is the case all over the North Sea[2]). This supposition is not only conveyed to us by the fact, that almost all, who for a longer series of years have taken part in the fishery in these seas, communicate as their experience, that the large plaice become less and less frequent, but comparisons between measurements of plaice from the North Sea with measurements of plaice from Iceland also suggest, that the stock of large plaice in the North Sea has highly decreased.

It is a well-known fact, that the plaice, which are caught at Iceland, are on an average proportionally large fish, much larger than those, which are at present caught in the North Sea. This fact may easily lead to the supposition that the Icelandic plaice is a form, which under normal conditions obtains a more considerable size than the North Sea plaice[3]). According to all probability this is however not the case. In my opinion the North Sea plaice — as well as the Färoe plaice — would under normal conditions, where the stock was not much affected by fishery, obtain a size at least as considerable as that of the Icelandic plaice.

[1]) H. KRØYER writes in "Danmarks Fiske" II p. 269: The fishermen on Hirtsholmen and on other places in the northern part of Jutland admit, that they never beheld any "Præsteflynder" of a lesser weight than 1 kilo. (about 42—47 cm.) and no "Rødspætte" (plaice) exceeding 2 kilo., while "Præsteflyndere" occurred of a weight up to 3·5 kilo.

[2]) This is for instance maintained by FR. HEINCKE: «Die Ueberfischung der Nordsee». Mitt. der Sektion für Küsten- und Hochsee-Fischerei. No. 3. 1894.

[3]) HOLT says about the Icelandic plaice in his treatise On the Iceland Trawl Fishery (Journ. Marine Biol. Assoc. Plymouth. III. p. 131): "The plaice are very large compared with North Sea fish ... The largest I measured was 30 inches long [76 cm.], but I am quite sure that I have seen specimens which were several inches longer. The maximum size recorded for North Sea fish is 28 inches [71 cm.].

Among ca. 12,000 marketable plaice measured during "Diana"s investigations at the coasts of Iceland in 1898—1901, the largest specimen was one of 79 cm., and any larger specimen has hitherto not been found among the many thousands of specimens, which later on have been measured from the "Diana" and the "Thor". From the Färoe Isles and the North Sea we know on the other hand considerably larger plaice. Among a few hundred specimens, which I measured at the Färoe Isles in the year 1900, there was a specimen of a length of 84 cm. and a weight of 6·5 kilo. Plaice of a weight of ca. 15 lbs. (6·8 kilo.) have several times been caught at the coasts of England [1]); this does however not represent the maximum size of the plaice there. FULTON writes in the 20th Scott. Fishery Report. 1902. p. 357: "So far as I am aware the largest plaice recorded was one caught on 20th May 1902 on the inshore fishing grounds, and landed at Grimsby. It measured 38½ inches [ca. 97 cm.] and weighed 28·5 lbs. [ca. 12·9 kilo.] [2]).

If we look at the size of plaice at first maturity, we find, that results of detailed investigations have not yet been published regarding the Icelandic plaice. It seems, however, as if the Icelandic plaice become mature for the first time at a similar size as the plaice in the northern part of the North Sea.

All considered, there is hardly any reason to suppose, that the individual maximum size of the Icelandic plaice on an average should be more considerable than that of the North Sea plaice under normal conditions.

When among 1000 plaice caught at Iceland at present there are on an average more medium-sized and large plaice than among 1000 caught in the North Sea, it is probably due to the circumstance, that the Icelandic stock of plaice is still far less affected by the fishery than the stock in the North Sea.

Some results of measurements of plaice from Iceland and the North Sea and Skagerak are stated below.

A. 2725 plaice above 26 cm. from the N. E. coast of Iceland between Kollimuli and Langanæs 15—60 meters, caught from the "Diana" by "snurrevaad" in 1899—1900.

The sizes were as follows:

Between	26—39 cm.	1130	specimens
—	40—49 —	930	—
—	50—59 —	435	—
—	60—69 —	204	—
—	70—79 —	26	—

B. 4253 plaice above 26 cm. caught in the Skagerak off Hirshals-Hanstholm by "snurrevaad" from Danish cutters in 1904. Depths 50—80 meters. Measured by Mr. CLOOS LORENTZEN.

Between	26—39 cm.	3906	specimens
—	40—49 —	323	—
—	50—59 —	20	—
—	60—69 —	3	—
—	70—79 —	1	—

C. 701 plaice above 26 cm. caught in the eastern part of the North Sea from the "Thor" in 1903 by 50 f. Ottertrawl. Depth 20—60 meters.

[1]) DAY says about the large plaice in Fishes of Great Britain and Ireland 1880—84. II. p. 28: "At Belfast an example of 12 lb. in weight was taken and sent to the University Museum. Although one of these fish, weighing 6 or 7 lb. is a fine example, DONOVAN and others have recorded it up to 15 lb. weight".

[2]) The largest plaice recorded from the Danish inshore waters E. of the Skagen is, as far as I know, one mentioned in a communication to the "Fiskeritidende" 1886 p. 347. It is stated here, that a plaice of a length of 92 cm. and a weight of 8·9 kilo. was caught in the Sound at Copenhagen. There is no authority given, however, for the communication, so that it is perhaps somewhat doubtful, if it be right.

Among the large plaice caught in the Skagerak ARTH. FEDDERSEN records one of a length of 770 mm. and a weight of 6·25 kilo. (Fiskeritidende 1887 p. 155) and LILLJEBORG another of 774 mm. length and of 5·5 kilo. weight (Sveriges och Norges Fiskar II. p. 360).

Between 26—39 cm. ..... 651 specimens
— 40—49 — ..... 46 —
— 50—59 — ..... 3 —
— 60—69 — ..... 1 —

D. 99 plaice above 26 cm. from the North Sea N. E. of Doggerbank 55 m. "Thor", St. 67, September 24. 1903. 50 f. Ottertrawl. This is the station, where the "Thor" has caught proportionally most large plaice in the North Sea (the specimens are included in C).

Between 26—39 cm. ..... 54 specimens
— 40—49 — ..... 41 —
— 50—59 — ..... 3 —
— 60—69 — ..... 1 —

E. 1101 plaice above 26 cm. from Aberdeen Bay. November 6. 1901 (quoted from F. W. Fulton. Rate of growth of Sea-fishes II. 20th Scott. Fishery Report 1902).

Between 26—39 cm. ..... 907 specimens
— 40—49 — ..... 184 —
— 50—59 — ..... 10 —

The results of measurements stated above are here, for the sake of comparison, calculated at the rate of 1000 captured specimens for each place.

Cm.	A. North-East Iceland. 15—60 m.	B. The Skagerak. 50—80 m.	C. Eastern North-Sea. 20—60 m.	D. North-East of Doggerbank	E. Aberdeen Bay (Fulton)
26—39	415	918	929	545	824
40—49	341	76	66	414	167
50—59	159	5	4	30	9
60—69	75	1	1	10	
70—79	10	0·2			

Even if the percentage of marketable plaice surpassing 40 cm. in certain places of the North Sea is very considerable, the absolute number per square unit is exceedingly insignificant compared with what we find at Iceland.

I shall here set forth some comparisons between the results derived from the "Thor"s trawlings in the eastern part of the North Sea and at the north coast of Iceland. The same gear: 50 f. Ottertrawl, was employed in both places, and managed by the same man.

North Sea 1903. At 23 different stations on depths between 20 and 70 meters, the "Thor" only caught 50 plaice surpassing 40 cm. The duration of the hauls was 74 hours. The average catch per hour was thus 0·7 plaice above 40 cm. The station where "Thor" got the greatest number of large plaice per hour was St. 67 N. E. of the Doggerbank. Here we got 5 plaice above 40 cm. per hour. The catch per hour exceeded on no other station 2 plaice above 40 cm.

N. Iceland, Skialfandi Bay. June 1903. This area was the only one where the "Thor" fished for plaice at N. Iceland in 1903 (according to obliging communication from Dr. Johs. Schmidt).

a) June 19. 1903. Depth 8·5—23 fms. Duration of hauls: 6 hours, 15 min. No. of plaice above 40 cm.: 201. Catch per hour: 32 specimens above 40 cm.

b) June 23. 1903. Depth 8—14 fms. Duration of hauls: 3 hours. No. of plaice above 40 cm.: 98. Catch per hour: 33 plaice above 40 cm.

c) June 25. 1903. Depth 7—14 fms. Duration of hauls: 7 hours 30 min. No. of plaice above 40 cm.: 173. Catch per hour: 23 specimens above 40 cm.

d) June 26. 1903. Depth 7—14 fms. Duration of hauls: 10 hours 30 min. No. of plaice above 40 cm.: 155. Catch per hour: 15 specimens above 40 cm.

e) June 27. 1903. Depth 8—13 fms. Duration of hauls 5 hours. No. of plaice above 40 cm.: 127. Catch per hour: 25 specimens above 40 cm.

The figures quoted plainly point in the direction that the number of large plaice per square unit is far greater at the coasts of Iceland than in the North Sea. I think, that the most simple and natural explanation of this fact is, that the stock of large plaice in the North Sea has been depleted by the intense fishing.

How far it would pay to keep a great "accumulated stock"[1]) of plaice of such a considerable size, that they would not obtain the highest price per kilo. on the market, is very doubtful. When the plaice have reached a certain considerable size, their increase in value per year is very little — perhaps none — so that it is to be feared, that they in reality would take up the place for the medium sized and smaller plaice, whose increase in value per year is much more considerable[2]). — On the other hand it might be feared, that the disappearance of the large plaice would involve such a decrease in the number of spawning plaice, that the fry would be insufficient for the recruiting of the stock of marketable plaice. When we see how immensely large the stock of small young plaice is on the grounds in the south-eastern North Sea we get, however, the impression, that there hardly could be room for any more. I do not think that there is any large area at Iceland, where the young ones below 20 cm. are as numerous as at the Horn Reef. It may be maintained that the abundance of young plaice of the 0-, I- and II-Group is so great on the Horn Reef area that it is most doubtful if a still greater number would prove to be an advantage. As I have called attention to in the preceding, we have every reason to suppose that the slow growth of the plaice at Horn Reef is due to overcrowding.

It is doubtful whether it would be an advantage to maintain a great constant stock of very large plaice in the North Sea, but the point is: how shall we treat the stock of plaice in order to get as great a yield as possible in the long run.

An international size-limit, fixed on the foundation of marking experiments on a large scale, and extensive transplantations of young plaice from places, where they are crowded and grow slowly, to places where they are scarce and grow rapidly, would undoubtedly highly increase the yield of the fishery.

At present we do not know which size-limit would be the most advantageous. A size-limit of 30 cm. for the main part of the North Sea would undoubtedly do a great deal of good (see p. 27 ff.), but it is by no means excluded, that a higher size-limit would be more advantageous for all the off-shore grounds. In the present state of matters a too considerable part of the plaice-fishery in the North Sea is based on small plaice of a weight of ca. 2—6 kilo. per score.

2. The Danish Plaice-fishery in the Skagerak.

The old fishing gears for plaice in the small fishing villages on the Skagerak were ground-seines, used from the shore, and hooks. About the year 1878 the "snurrevaad" was introduced in the fishing villages of the eastern Skagerak: Hirtshals, Lønstrup, Løkken etc.[3]), and in 1886 it reached the western villages: Lild Strand and Hansted[4]). The snurrevaad was used from open boats, usually near the shore.

[1]) See C. G. Joh. Petersen: "What is Overfishing". Journal Marine Biol. Assoc. VI. No. 4. 1903.

[2]) That the large plaice also should be in the way of the very small ones of the 0- and I-Group we have no reason to suppose, as they live on different food. Thus it cannot be supposed, that the fact, that the large plaice disappear, should have the effect of increasing the number of plaice belonging to the 0- and the I-Group.

[3]) See Nordisk Tidsskrift for Fiskeri. V. Aargang. 1879. p. 50—51.

[4]) Fiskeritidende 1887. p. 73.

In the first years after the introduction of the snurrevaad to these small villages there was a very great increase in the catch, and the yield in kilogram per year was the greatest ever known.

It appears however from a series of statistical data, that when an important plaice-fishery had been carried on by the large cutters on the off-shore grounds in the Skagerak during some years, from 1880—1890, the yield of the shore fishery for plaice decreased very much.

Of such statistical data the following may be set forth here.

a) The yield of the shore fishery from the Løkken district.

1884. In "Fiskeritidende". 1890 p. 2—5 it is stated by Fr. Fiedler, that the plaice-fishery from Løkken in 1884 was richer than it had ever been before. The total yield was estimated to ca. 10,000,000 kilo. (in all probability this estimate was too high, it is nearly as much as the total yield of the Danish plaice-fishery at present).

1885. In "Fiskeritidende". 1885 p. 270 it has been stated, that the exportation of plaice in the month of May was more than 500,000 kilo.

1887. In the official reports the yield of the plaice-fishery for the whole year has been put down to 875,000 kilo.

1889. In "Fiskeritidende". 1890, p. 2—5 the yield of the plaice-fishery for the spring has been stated to ca. 1,000,000 kilo.

In comparison with the yield stated here all the following years from 1891 and onwards show an enormous decrease (the figures are quoted from the official reports).

1891	123,000 kilo.	1898	59,000 kilo.
1892	63,000 -	1899	3,000 -
1893	23,000 -	1900	1,000 -
1894	18,000 -	1901	2,000 -
1895	54,000 -	1902	113,000 -
1896	81,000 -	1903	22,000 -
1897	10,000 -		

b) The yield of the shore fishery from the Hjørring district.

The figures from 1874—77 are quoted from "Nordisk Tidsskrift for Fiskeri" 5. Aarg. 1879; the figures for 1891—1903 from the official fishery-reports.

Year	No. of scores	Value in Kroner
1874	31,000	45,000
1875	65,000	100,000
1877	65,000	85,000
1891	.....	9,000
1892	.....	9,000
1893	.....	100
1894	.....	6,000
1895	.....	7,000
1896	.....	12,000
1897	.....	1,000
1898	.....	11,000
1899	.....	3,000
1900	.....	600
1901	.....	5,000
1902	.....	12,000
1903	.....	15,000

It appears from these figures, that the yield of the shore fishery for plaice in this district was much larger, before the cutter fishery began, than it has been for the last 13 years.

c) A survey over the total yield of the plaice-fishery from boats belonging to the Skagerak coast is represented in the table below. Only a single year, viz. 1887, represents the period, when the coast-fishery for plaice was flourishing. All the other years plainly point out the predominating influence of the Kattegat-cutters. For the years 1887—1894 the yield for the fishing villages: Hansted, Lild, Thorupstrand, and Slettestrand has been deducted; with regard to the total yield this is however of slight importance.

The total yield of the plaice-fishery from the small fishing villages at the Skagerak.

Year	Statement about number of specimens	Statement about Danish lbs.	Yield in kilogram, approximately	Value in Kroner.
1887	16,100	1,856,263	935,000	101,795
1891	4,200	348,245	176,000	30,504
1892	1,920	232,152	233,000	22,204
1893	0	47,325	47,000	3,857
1894	54,000	119,303	81,000	9,310
1895	36,080	361,625	195,000	26,734
1896	83,750	292,110	180,000	32,163
1897	62,620	27,675	39,000	10,319
1898	106,360	231,238	158,000	32,682
1899	96,020	24,750	51,000	15,934
1900	53,160	4,520	24,000	9,376
1901	112,280	25,300	57,000	15,742
1902	195,220	325,550	241,000	56,665
1903	133,140	149,616	124,000	38,789

The plaice-fishery was still in 1887 the most important fishery from the small fishing-villages on the Skagerak coast. In the long run it became however impossible for the fishermen on the Skagerak coast to compete with the large cutters, for which reason they were forced to give up the plaice-fishery as chief-fishery and instead make the cod- and haddock-fishery their most important trade. Thus it is interesting to see, that while the yield in 1887 from boats on the Skagerak coast amounted to ca. 935,000 kilo. plaice, ca. 300,000 kilo. haddock and ca. 250,000 kilo. cod: the yield was ten years later (1897): ca. 39,000 kilo. plaice, ca. 330,000 kilo. haddock and 525,000 kilo. cod. In the very latest years, there has again been an increase in the plaice-fishery from the fishing-villages on the Skagerak-coast, which is due to the introduction of motors in some of the boats. The small fishing boats begin again to some degree to compete with the large cutters.

The figures of the tables on p. 45—46 suggest, that the yield of the plaice-fishery in the Skagerak is subject to very great fluctuations. The survey over the Kattegat-cutters' yield in the seas beyond the Skagen point in the same direction. Some reason for these great fluctuations may probably be looked for in the larger or smaller amount of fishing. It will thus be seen from the table on p. 40, that the yield in the years, when proportionally many cutters took part in the fishery, is far greater than in the years, when proportionally few were engaged.

It may be maintained, that the reason why a more or less considerable number of cutters take part in the Skagerak fishery, is to be looked for in the frequency of plaice in our different seas. If for instance the cutters in a certain year catch 6 scores per haul, on an average, in the Kattegat and 5 scores in the Skagerak, it may be, that proportionally many cutters will stay in the Kattegat during that year. If next year the cutters catch 5 scores per haul in the Kattegat and 6 scores in the Skagerak, it may happen, that proportionally many cutters will fish in the Skagerak. It is most likely, that the

great fluctuations in the yield with regard to the Skagerak and the Kattegat do not correspond to so great variations in the size of the stock itself.

As the coast-fishery for cod, haddock and lobster since 1890 has been more important than the plaice-fishery, it is an obvious conclusion that the attention bestowed on the plaice-fishery essentially depends upon the yield of the other fisheries.

Some reasons for the fluctuations in the yield from the Skagerak may probably also be looked for in the migrations of the plaice. How far the Skagerak on the whole receives a higher contribution of grown-up plaice from the adjacent seas (the North Sea and the Kattegat), than it yields to these, is a question, on which the marking experiments have not yet thrown any light.

We have not at hand complete statistical data showing the total yield of the plaice-fishery in the Skagerak during the first year after the introduction of the "snurrevaad", from about 1878 to 1889, but according to the information at hand we must suppose that the yield has in this period been considerably greater per year than in the period from 1890 to 1903 (see p. 40, 45 and 46). It can hardly be doubted, that the number of large plaice in the Skagerak has been far greater in the first named period than in the last named. From the table on p. 32 (Size of marketable plaice in the Skagerak) it will be seen, that plaice of a weight of more than 15 kilo. per score have not been recorded in the official reports for the years from 1897—1899. Formerly the fishermen counted with plaice of a much higher weight per score. In the Fiskeritidende for 1885 p. 249—250 it is stated, that the average weight of plaice exported from Løkken was ca. 25 kilo., and in the same review for 1890 p. 2—5 the weight of first class plaice is said to have been 32 kilo. per score for the year 1884[1]).

In the Skagerak it seems as if there is no great stock of small young plaice (see Pl. I), so that the number of plaice, which yearly grow up and become marketable, is probably not very great. It is evidently a great loss here to fish small plaice, as there are few of them and as they grow very rapidly. A size-limit of at least 30 cm. would undoubtedly here be very profitable (see p. 27 ff.).

From the little town Skagen a considerable plaice-fishery takes place from open boats on the border of the Skagerak and Kattegat. The fishery is carried on close to the coast at depths up to ca. 20 fms. The table below regarding the development of the Skagen plaice-fishery is in many respects of interest. While it may be presumed, that the intensity with which the fishery has been carried on, has increased rather evenly, very great fluctuations have, on the contrary, taken place in the yield in scores. One of the reasons both for the considerable yield and the great fluctuations may undoubtedly be ascribed to migrations of plaice. It may hardly be imagined, that the small area on which the plaice-fishery is carried on, should be able to nourish any large constant stock. According to the "Thor"s investigations there is not at Skagen a stock of young plaice approximately so rich as off Esbjerg (see Pl. I—III). The entire area on which the plaice-fishery as a rule is carried on, amounts in the highest estimate to ca. 10 Eng. square miles and from this small area the fishermen from Skagen land more than half as many plaice as the other Danish fishermen catch in the entire Skagerak, and ca. $^1/_4$ as many as our total yield from the whole Kattegat amounts to. It is probable, that the plaice, when migrating from the Skagerak to Kattegat or vice-versa, always must keep rather close to the coast off Skagen on account of the fact, that the sea-bed slopes rapidly here to considerable depths.

In the Danish fishery-reports the fishery from Skagen is counted with the Kattegat-fishery. The main part of the plaice landed in Skagen is however caught on the northern coast, it is practically in the Skagerak. The average weight of the marketable plaice landed in Skagen, amounts to ca. 6·5 kilo. per score. In the Fishery-report for the year 1895, it has been calculated, that 661,000 kilo. correspond

[1]) The weight of 25—32 kilo. per score is even for the Icelandic plaice a rather considerable weight. See W. Lundbeck in Fiskeri-Beretning for 1892—93 p. 157—167; and A. C. Johansen in Fiskeri-Beretning for 1901—1902 p. 235—38. The largest plaice recorded from Iceland by Lundbeck had a weight of 45 à 50 kilo. per score.

to ca. 100,000 scores. The great majority of the plaice landed in Skagen are caught by "snurrevaad". During the last few years motors have been introduced into many of the Skagen fishing-boats.

The yield of the plaice-fishery from Skagen.

Year	No. of fishing-boats, approximately	No. of scores	Value in Kroner
1890	c. 110	52,000	85,000
1891	c. 110	57,000	91,000
1892	c. 110	91,000	118,000
1893	c. 110	47,000	86,000
1894	c. 110	70,000	92,000
1895	c. 110	100,000	165,000
1896	c. 120	172,000	241,000
1897	c. 120	172,000	241,000
1898	c. 131	257,000	332,000
1899	.....	150,000	257,000
1900	c. 147	61,000	162,000
1901	c. 140	104,000	203,000
1902	.....	155,000	234,000
1903	.....	153,000	320,000

3. The plaice-fishery in the Limfjord.

Regarding the stock of plaice in the Limfjord I shall here call the attention to C. G. Joh. Petersen: "The yearly immigration of young plaice into the Limfjord" (Report of the Danish Biol. Station. VI. København 1897). In this work Dr. Petersen shows, that the plaice does not breed in the Limfjord, and that the stock is recruited by immigration of fry from the North Sea. He also accounts for the transplantations of plaice, which dates from the year 1892, and since that time have been continued.

The transplantations of plaice in the Limfjord take place to no great extent as yet, still they become gradually more extensive. In 1902 ca. 258,000 specimens were transplanted at a cost of ca. 2,800 Kroner. The profit of this transplantation may be estimated to ca. 30,000 Kroner (see the Danish fishery report for 1901—1902).

With regard to the yearly yield of the plaice-fishery in the Limfjord we have at hand statistical data for a long series of years. The table below has been compiled from the following sources:

"Forsøg til en Oversigt over de Fiskeriet i Danmark vedrørende ældre og nyere Lovregler" by M.[1]). Tidsskrift for Fiskeri. IV. Aargang. 1870 (contains the reports from 1859—1869). Tidsskrift for Fiskeri. V—VII. Aargang. København 1871—1873 (communicated by B. Andersen). Nordisk Tidsskrift for Fiskeri. I.—VII. Aargang. København 1874—1882 (communicated by B. Andersen). Ministerialtidende for 1882—1890. Fiskeri-Beretning for 1890—91 to 1903—04.

For the years 1896, 1897 and 1899 the yield is stated in scores in the reports. As a factor for converting scores into kilo., I have taken 4·5.

It will be seen, that the number of fishing gears has increased very much since 1862, and that the yield in Kroner has also increased very considerably, but it is most doubtful, if there on the whole has been any increase in the number of scores and kilo. It is very probable, that the price per score has been about 3 times as high at the end than at the beginning of the period from 1859—1903.

B. Andersen writes in Tidsskrift for Fiskeri VI. Aargang København 1872 p. 204 about the price of the Limfjord plaice: "The price varies much on account of the size of the fish. One score of plaice caught in gill-nets cost 1 Krone (3 Mark), while 1 score caught by "snurrevaad" only cost half the amount because they are much smaller and often unsaleable". As the total value of the plaice

[1]) The present member of the supreme court F. Mourier.

caught by the snurrevaad in the beginning of the seventies was about twice the total value of plaice caught by gill-nets (see p. 50) the average price per score seems to have been ca. 60 Øre during that period, and in the sixties it has undoubtedly been still lower. In 1899 the average price per score was ca. 99 Øre and in 1903 ca. 140 Øre.

All considered, I think it most probable that the yield in scores has kept about the same niveau in the period from 1859—1903. There has been considerable fluctuations, but no pronounced increase or decrease in the yield of scores per year. The great increase in the number of fishing gears seems thus to have been in vain. With the small number of fishing gears which were at hand more than 40 years ago the fishermen seem to have been able to get about the same yield in scores, as they can take with the great amount of fishing gears at present.

The plaice-fishery in the Limfjord.

Period	No. of gill-nets	No. of snurre-vaad (plaice-seines)	No. of scores caught	No. of kilogram	Value in Kroner
1/IV 1859—31/III 60	.....	...	.....	.....	103,000
- 1860— - 61	.....	...	.....	.....	129,000
- 1861— - 62	.....	...	.....	.....	136,000
- 1862— - 63	2,137	223	.....	.....	88,000
- 1863— - 64	2,243	221	.....	.....	109,000
- 1864— - 65	1,188	135	.....	.....	34,000
- 1865— - 66	1,439	168	.....	.....	66,000
- 1866— - 67	977	132	.....	.....	57,000
- 1867— - 68	1,360	170	.....	.....	64,000
- 1868— - 69	1,168	221	.....	.....	63,000
- 1869— - 70	1,232	252	.....	.....	76,000
- 1870— - 71	1,626	249	.....	.....	74,000
- 1871— - 72	1,438	234	.....	.....	73,000
- 1872— - 73	1,514	272	.....	.....	95,000
- 1873— - 74	1,809	288	.....	.....	130,000
- 1874— - 75	2,517	258	.....	.....	143,000
- 1875— - 76	2,619	228	.....	.....	108,000
- 1876— - 77	2,393	260	.....	.....	114,000
- 1877— - 78	.....	237	.....	.....	103,100
- 1878— - 79	3,426	268	.....	.....	138,000
- 1879— - 80	3,371	339	.....	.....	183,000
- 1880— - 81	3,371	339	.....	.....	180,000
- 1881— - 82	3,193	309	.....	.....	142,000
- 1882— - 83	3,598	321	.....	.....	153,000
- 1883— - 84	4,825	345	.....	.....	183,000
- 1884— - 85	3,070	325	.....	.....	134,000
- 1885— - 86	3,905	355	.....	.....	129,000
- 1886— - 87	3,260	311	.....	.....	113,000
- 1887— - 88	3,629	332	.....	.....	117,000
In the year 1890	7,744	334	.....	.....	253,000
- - — 1891	7,814	315	.....	.....	228,000
- - — 1892	8,915	351	.....	.....	301,000
- - — 1893	10,074	368	.....	.....	310,000
- - — 1894	11,160	374	.....	.....	320,000
- - — 1895	11,154	365	.....	.....	300,000
- - — 1896	9,548	365	272,780	c. 1,228,000	229,000
- - — 1897	10.464	363	243,740	c. 1,097,000	210,000
- - — 1898	10,890	370	.....	1,062,000	278,000
- - — 1899	11,690	376	295,380	c. 1,329,000	291,000
- - — 1900	11,610	394	.....	1,355,000	311,000
- - — 1901	11,185	397	.....	671,000	196,000
- - — 1902	11,683	451	.....	1,227,000	332,000
- - — 1903	12,032	461	.....	1,618,000	496,000

In the statistical reports it has been stated for several years how much of the yield is due to the various gears. It appears from the reports that ca. 55 % of the yield is due on an average to the "snurrevaad", ca. 44 % to the gill-nets and ca. 1 % to the ground-seines. The yield per snurrevaad has been ca. 10 times as much as the yield per gill-net.

The figures are as follows:

The catch of plaice by the various gears in the Limfjord.

Year	No. of snurre-vaad	Yield in Kroner	No. of gill-nets	Yield in Kroner	No. of ground-seines	Yield in Kroner
1862—63	223	53,000	2,137	31,000	29	4,000
1863—64	221	66,000	2,243	37,000	31	6,000
1864—65	135	17,000	1,188	15,000	12	2,000
1865—66	168	35,000	1,439	25,000	27	7,000
1866—67	132	36,000	977	18,000	19	4,000
1867—68	170	44,000	1,360	19,000	2	400
1868—69	221	44,000	1,168	19,000		
1869—70	252	54,000	1,232	22,000		
1870—71	249	47,000	1,626	26,000		
1871—72	234	47,000	1,438	26,000		
1872—73	272	65,000	1,514	30,000		
1873—74	288	70,000	1,809	60,000		
1874—75	258	69,000	2,517	74,000		
1875—76	228	44,000	2,619	64,000		
1876—77	260	54,000	2,393	56,000	26	4,000
1877—78	237	55,000	?	44,000	4	1,000
1878—79	268	71,000	3,426	67,001		
1879—80	339	113,000	3,371	71,000		
1880—81	339	80,000	3,371	97,000		
1881—82	309	75,000	3,193	66,000	7	1,000
1882—83	321	79,000	3,598	73,000	3	1,000
1883—84	345	116,000	4,825	65,428	3	1,000
1884—85	325	73,000	3,075	62,000		
1885—86	355	70,000	3,905	78,000		
1886—87	311	50,000	3,260	63,000		
1887—88	332	54,000	3,629	62,000		

4. The Danish plaice-fishery in the Kattegat.

Before the Danish "snurrevaad-fishery" commenced from the cutters in the year 1880, the plaice-fishery was as a rule carried on near the places, to which the vessels belonged. When the building of the larger cutters commenced, it was soon discovered, that these often obtained a greater catch in the North Sea or Skagerak than inside the Skagen[1]). Ere long it became a general custom, that most of the cutters fished in the North Sea and Skagerak in Summer, when the weather was fine, and in Kattegat in spring and autumn.

The yield of the plaice-fishery from the Danish vessels belonging to the seas east of Skagen is stated in the table below according to the Danish fishery-reports. The statistics do not only comprise plaice, but partly also flounders and dabs. The great mass of the yield consists, however, of the plaice. Only for the years 1902 and 1903 has it been possible to separate the yield of the flounder- and dab-fishery from that of the plaice-fishery. For the year 1902 the total yield was 1,433,000 scores of a value of 2,088,000 Kroner. Of this the yield of the dab- and flounder-fishery came to 287,000 scores and 137,000 Kroner, or ca. 20 % of the number of the scores and 6·5 % of the value. When a small part

[1]) With the seas "inside the Skagen" or "east of the Skagen" is meant the Kattegat, the Belt Sea, and the Baltic; with the seas "beyond the Skagen" is meant the Skagerak and the North Sea.

of the yield has been given in Danish lbs. for certain years, this has been converted into scores according to the tables on p. 32—34. For the year 1894 the yield has by a mistake been stated ca. 145,000 scores too low in the official reports, as the yield of the Limfjord cutters' catch in the Kattegat was left out of consideration in the statement of the total number of scores. For the years 1899—1900 the official statistics do not comprise the yield of the cutters from the Limfjord east of Løgstør. This yield has been roughly calculated by the author and included (it is supposed, that the price per score for the Limfjord cutters has been about the same as for the cutters from Frederikshavn and Grenaa).

For the year 1901 the author has based his calculation of the yield of the cutter fishery on Captain Hansen's extractions from the cutter-journals, (see p. 55) while the remaining yield is stated according to the fishery-reports.

In spite of essential defects of the statistics at hand, it surely offers some very useful information with regard to the yield of the plaice-fishery from 1885 and onwards. Thus it appears from the statistics, that the yield by no means has increased at the same rate as the intensity, with which the fishery has been carried on. While the number of cutters, from which the plaice-fishery was carried on during the series of years in question, has increased from ca. 80 to more than 200, and while the steam- or other motor-power has been introduced to a great extent — the total yield of the catch in scores has increased very little.

The yield of the Danish plaice-fishery in the North Sea, the Skagerak, the Kattegat, the Belt Sea and the Baltic from vessels belonging to the seas east of the Skagen.

Year	No. of scores	Value in Kroner	Price per score	Remarks
1885	1,015,000	892,000	0·88	Flounders and dabs partly included
1886	813,000	708,000	0·87	— - — — —
1887	907,000	788,000	0·87	— - — — —
1888	677,000	784,000	1·16	— - — — —
1889	812,000	1,116,000	1·37	— - — — —
1890	872,000	1,157,000	1·33	— - — — —
1891	754,000	1,102,000	1·46	— - — — —
1892	865,000	1,198,000	1·38	— - — — —
1893	782,000	1,083,000	1·38	— - — — —
1894	951,000	1,255,000	1·32	— - — — —
1895	1,005,000	1,285,000	1·28	— - — — —
1896	1,058,000	1,566,000	1·48	— - — — —
1897	941,000	1,426,000	1·52	— - — — —
1898	1,144,000	1,817,000	1·59	— - — — —
1899	1,118,000	1,773,000	1·59	— - — — —
1900	860,000	1,600,000	1·86	— - — — —
1901	1,215,000	1,953,000	1·61	— - — — —
1902	1,433,000	2,088,000	1·46	— - — — —
1902	1,146,000	1,951,000	1.70	Only plaice
1903	994,000	1,994,000	2·01	— —

While it is of interest to survey the total yield of the plaice-fishery of all vessels from the seas east of the Skagen, it is of still greater interest to regard the yield during a series of years from one single limited area, where the Danish plaice-fishery always had preponderance. Such an area is the Kattegat. How great the yield of the Danish plaice-fishery has been for the Kattegat alone, has not been stated directly in the fishery-reports; the reports, however, offer such information, that this yield can be calculated roughly for a series of years. It appears from the facts mentioned before, that the intensity with which the Danish plaice-fishery has been carried on since 1872 has increased exeedingly. This increase in the amount of fishing or in the intensity of fishing has for no area been greater than

for the fishing grounds of the Kattegat. The majority of our cutters belong to the Kattegat ports, and as far as they get sufficient catches in the Kattegat, they remain there and do not go further out. I also wish to call attention to the fact, that the Swedish "snurrevaad-fishery", which mainly takes place in the Kattegat, has developed considerably since the middle of the nineties. It is beyond any doubt, that the area in the Kattegat over which a "snurrevaad" is daily moved has increased exceedingly during the last thirty years.

With respect to the Kattegat we shall regard the following periods in the history of the plaice-fishery since 1872.

I. The period from 1872—1879.

The plaice-fishery was chiefly a shore-fishery, and the gears were gill-nets, ground-seines, hooks etc. The fishermen began, however, to employ small "snurrevaad" of a length of 30—40 fms. and with lines of a length of 100—150 fms. The seines were used from open boats and usually hauled in by the hands. It may be seen from material collected by Mr. Cloos Lorentzen, that this "snurrevaad-fishery" has been carried on to no small extent, and that it dates back at any rate as far as to 1873 [1]).

II. 1880—1889.

From 1880 the "snurrevaad-fishery" began from the large cutters provided with a pond. A hand-winch was introduced to haul the seines; this made it possible to employ larger seines of a length of ca. 50—60 fms. — and longer lines (ca. 200—400 fms.).

The number of cutters from Frederikshavn, Sæby, Læsø, the Limfjord east of Løgstør, Grenaa, Aarhus, and Hov were as follows:

1880.....	2	cutters
1885.....	54	—
1886.....	55	—
1887.....	81	—
1888.....	100	—
1889.....	123	—

The snurrevaad-fishery was now gradually extended over all the suitable parts of the western Kattegat to a depth of ca. 30 à 40 meters.

III. 1890—1897.

In 1890 the main part of the cutters were provided with steam- or other motor-power for the winch. The length of the lines of the snurrevaad was increased, as a rule to ca. 500 à 800 fms. The number of cutters from the places mentioned above, was as follows:

1890.....	158	cutters
1891.....	157	—
1892.....	143	—
1893.....	141	—
1894.....	148	—
1895.....	139	—
1896.....	133	—
1897.....	151	—

The increase of the fishing grounds in the Kattegat, which took place in 1890 and ensuing years, was hardly considerable; most likely it only consisted of a rather small narrow belt in the eastern Kattegat from a depth of ca. 30 to ca. 50 meters.

[1]) See also: Jonas Collin: "Bidrag til Kundskab om Danmarks Fiskerier". Nordisk Tidsskrift for Fiskeri. I. Aarg. 1874, p. 196 and H. V. Fiedler's treatise in the same review. VI. Aarg. 1881. p. 126—127.

IV. 1898—1901.

The fishing power became considerably augmented by the introduction of an auxiliary screw in the cutters and by more powerful motors. The number of cutters from the above-named places was as follows:

1898..... 163 cutters
1899..... 186 —
1900..... 199 —
1901..... 177 —

V. 1902—1903.

The fishing-power of the cutters became again considerably augmented by the introduction of motors in the small boats, which are helping in shooting the snurrevaad.

The development has also partly taken another direction. In Frederikshavn there was in 1903—1904 built several small cutters of 12—16 tons brutto, which shoot the seines from a buoy themselves, so that a motor-boat becomes superfluous. The advantage of these cutters is, partly, that they can do with one à two men less (four men instead of 5 or 6), partly, that the fishery in rough weather may be carried on longer than formerly, when it depended on, how long the small open boat could manage. These cutters are provided with a very strong motor (10—15 indic. horse-power), which gives the cutter a speed of $5^1/_2$—7 miles per hour. It is doubtful, however, if these cutters will succeed in replacing the larger ones.

The number of cutters from the above-named places was as follows:

1902..... ca. 175 cutters
1903..... - 175 —

We have fortunately at hand a series of data affording information about the yield of the plaice-fishery during a rather long period with regard to the Kattegat. A survey over the yield of the Danish plaice-fishery from fishing vessels belonging to the Kattegat from 1885 to 1903 is represented below. The figures may be obtained from the official reports by deducting the yield of the Belt Sea and the Baltic boats from that of all the boats from the seas east of the Skagen. The stated yield comprises, however, also, what the Kattegat cutters have fished in the Skagerak and the North Sea. This is rather considerable and must be subtracted, if we wish to know that of the Kattegat separately. From 1895 and onwards we find in the reports an estimate of the value of the fish, taken in the Skagerak and the North Sea. The vast majority of this yield consists of plaice. It appears from the cutters' journals, that the value of all other fish only amount from ca. 1 to ca. 4 %, on an average to ca. 2 % [1]). Thus we are able to find an approximate value of the plaice, caught by the Kattegat cutters beyond the Skagen, and as the price per score has been stated for a considerable number of these plaice, we may also determinate the number of the scores. As the Kattegat cutters fish in the Belt Sea only to a very slight degree, the yield of this fishery has not been taken into consideration (the yield of later years amounts to ca. 20,000 Kroner pro anno). The fact, that a slight fishery has been carried on in the Kattegat by cutters from the Belt Sea has not been taken into consideration either.

The yield of the plaice-fishery from the Kattegat alone is stated on p. 57. I shall here set forth some details with regard to the calculation of the Kattegats-cutters' catch beyond the Skagen etc.

For the year 1895 the value of the Kattegat cutters' catch beyond the Skagen is stated to be 425,000 Kroner. From this we must subtract 2 % as an approximate value of other fish than the plaice. The 2 % are calculated from fishing results of a certain number of cutters for the years 1897—1902, published in the fishery-reports. The value of the plaice alone amounts to ca. 416,000 Kroner. The

[1]) Of the fish caught by cutters in the Kattegat, the value of the plaice amounts on an average to ca. 92 %, while the other fish have a value of ca. 8 %. The cutters catch on an average considerably more soles, brills and cod in the Kattegat than in the Skagerak and the North Sea.

price per score is calculated to be 246 Øre. The number of the scores will consequently amount to ca. 169,000. In the fishery-reports it has namely been stated, that the price of 7,034 scores, which practically were all caught beyond the Skagen, came to 17,277 Kroner. The information at hand, with regard to the price per score, is for this year based on a far smaller material than for the following years.

The yield of the Danish plaice-fishery in the Kattegat, the Skagerak and the North Sea from vessels belonging to places in the Kattegat.

Year	No. of scores	Value in Kroner	Average price per score	Remarks
1885	929,000	822,000	0·88 [1]	Flounders and dabs included
1886	714,000	619,000	0·87	— - — —
1887	790,000	681,000	0·86	— - —
1888	553,000	675,000	1·22	— - —
1889	679,000	984,000	1·45	— - — —
1890	725,000	1,010,000	1·39	— - — —
1891	600,000	964,000	1·61	— - — —
1892	715,000	1,065,000	1·49	— - — —
1893	649,000	971,000	1·50	— - —
1894	789,000	1,131,000	1·43	— - — —
1895	849,000	1,163,000	1·37	— - — —
1896	883,000	1,434,000	1·62	— -
1897	767,000	1,316,000	1·72	— - —
1898	963,000	1,664,000	1·73	— - — —
1899	849,000	1,581,000	1·86	— - — —
1900	635,000	1,391,000	2·19	— - —
1901	944,000	1,668,000	1·77	— - — —
1902	1,138,000	1,817,000	1·60	— - — —
1902	994,000	1,757,000	1·77	Only plaice
1903	839,000	1,828,000	2·18	— —

For the year 1896 the value of the Kattegat cutters' catch beyond the Skagen is stated to amount to 362,000 Kroner. By subtracting 2 % we get the value of the plaice: ca. 355,000 Kroner. In the fishery-reports the price of 15,754 scores caught beyond the Skagen has been put down as 47,514 Kr. This gives a price of 302 Øre per score. The number of scores will consequently be ca. 118,000.

For the year 1897 the value of the Kattegat cutters' catch beyond the Skagen is estimated to come to 314,435 Kroner. From this amount is deducted 3·7 % for this year for other fish than the plaice. The remaining sum: 303,000 Kr. represents the value of the plaice alone. 52,800 scores of plaice caught beyond the Skagen amounted to 134,223 Kr. This gives an average price of 254 Øre per score. The number of scores is according to this ca. 120,000.

For 1898 the value of the Kattegat cutters' catch in the North Sea and the Skagerak is put down as 176,000 Kr., a statement, which for this year only comprises the great majority of the cutters, not them all. If 1·8 % is subtracted, 173,000 Kr. remain as the value of the plaice. As 22,045 scores, caught beyond the Skagen, cost 52,401 Kr., the price per score is calculated to be 238 Øre. We obtain consequently a number of 73,000 scores of plaice for the seas beyond the Skagen. As this number has been calculated a little too low, the yield for the Kattegat appears a little too high.

For 1899 the value of the Kattegat cutters' catch beyond the Skagen is put down as 367,000 Kr. If 2·2 % is subtracted, ca. 359,000 Kr. remain as the value of the plaice alone. The price of 68,980 scores of

[1]) According to H. Krøyer the price per score for plaice caught in the northern Kattegat was ca. 33—42 Øre (16—20 ß) in 1837. („Prøve af en historisk-statistisk Udsigt over de danske Fiskerier». Tidsskrift for Fiskeri I. Aarg. København 1866).

plaice caught by these cutters amounts to 106,498 Kr. The average price per score will consequently be 154 Øre, and the number of scores ca. 233,000.

For the year 1900 the yield of the plaice-fishery at the Horn Reef for 45 "foreign"[1]) cutters is in the Esbjerg statistics put down to 697,780 kg. and 132,636 Kr. 36 of the foreign cutters belonged to the Kattegat, 9 to the Limfjord west of Løgstør. Starting from this we will suppose, that the Kattegat cutters have taken 80 % and the Limfjord cutters 20 % of the catch. The value of the catch of the Limfjord cutters must according to this be calculated to 26,527 Kr. As the total yield for the Limfjord cutters has been 46,700 Kr., we may reckon, that they have brought ca. 57 % of their total yield to Esbjerg. (We will here suppose, that they have taken a similar percentage of their catch to Esbjerg for the following years 1901—1903).

Thus the yield of the Kattegat-cutters' catch at Horn Reef may for the year 1900 be put down to ca. 558,000 kilo. and ca. 106,000 Kr. The 558,000 kilo. correspond to ca. 110,000 scores (see p. 31). The Kattegat cutters' catch beyond the Skagen amounts to ca. 209,000 Kr. When subtracting 1·1 % from this amount we obtain the value of the plaice: ca. 207,000 Kr. Of this sum 106,000 Kr. falls to the Horn Reef. The remaining 101,000 Kr. partly falls to the Hanstholm-Søndervig area, partly to the Skagerak. It has been stated in the fishery-reports, that 20,918 scores, caught beyond the Skagen, cost 53,440 Kr. or ca. 255 Øre per score. This high price shows at any rate, that no essential part of these plaice were caught at the Horn Reef. If we take the 255 Øre as the price per score for plaice in the Skagerak and the Hanstholm-Søndervig area, the number of scores for these areas must be calculated to ca. 40,000, and the entire number of scores caught beyond the Skagen to ca. 150,000.

In the year 1901 the Kattegat cutters have fished for ca. 873,000 Kr. in the Kattegat. It appears from the reports, that ca. 93·9 % or ca. 820,000 Kr. originate from the plaice. According to Captain C. J. Hansen, 27 cutters fished in the Kattegat 48,063 scores of plaice of a value of 114,003 Kr. This gives a price of 237 Øre or ca. 346,000 scores for the Kattegat. The yield of the Kattegat cutters' catch beyond the Skagen amounts to 405,000 Kr. As 2·1 % has to be subtracted, 396,000 Kr. remain as the value of the plaice alone.

The "foreign" cutters have taken 692,720 kilo. of a value of 127,951 Kr. to Esbjerg from the Horn Reef. Of this the Kattegat cutters' yield has been calculated in a similar way as for 1900 to be 535,500 kilo. and 94,000 Kr. If the weight per score is put down as 5·2 kilo. we get ca. 103,000 scores of a value of ca. 94,000 Kr. For the Skagerak and Hanstholm—Søndervig area the yield of the plaice-fishery must consequently be supposed to be ca. 302,000 Kr. Of 63,716 scores, caught by 27 cutters, the 48,063 scores were, according to Captain Hansen, fished in the Kattegat, and 15,653 scores in the Skagerak and Hanstholm-Søndervig area. As the entire yield for the Kattegat amounts to ca. 346,000 scores, the yield for the Skagerak and the Hanstholm-Søndervig area may after this be calculated to ca. 115,000 scores. These figures are rather doubtful, but it will be seen, that in this case it is of no consequence with regard to the calculation of the cutters' catch in the Kattegat.

In 1902 the Kattegat cutters fished for 622,000 Kr. beyond the Skagen. If 1·4 % is deducted, we get the yield of the plaice alone: ca. 613.000 Kr. At Horn Reef the yield is for the "foreign" cutters 1,590,500 kilo. and 257,116 Kr. By subtracting the yield of the Limfjord cutters, we obtain for the Kattegat cutters ca. 1,477,000 kilo. of a value of 229,000 Kr. The weight per score may be reckoned to 5·4 kilo. (see p. 31), and the number of the scores will then be ca. 274,000. As the entire yield of the plaice-fishery beyond the Skagen is ca. 613,000 Kr., and the yield for the Horn Reef alone 229,000, the yield for the Skagerak and Hanstholm-Søndervig area will consequently be ca. 384,000 Kr.

The Kattegat cutters' entire yield, is for 1902: 718,000 scores and 1,336,000 Kr. The yield for the Horn Reef is: 274,000 scores and 229,000 Kr. For the Kattegat, Skagerak and Hanstholm-Søndervig

[1]) o: cutters from other ports than Esbjerg.

area the yield will consequently be 444,000 scores and 1.107,000 Kr. Of 150,996 scores from these areas, 56·8 % were caught in the Kattegat and ca. 43·2 % in the Skagerak and Hanstholm-Søndervig area (acc. to Captain HANSEN). Thus the distribution of the 444,000 scores may be calculated to be like this: 192,000 scores of a value of 384,000 Kr. falls to the Skagerak and Hanstholm-Søndervig area, and ca. 252,000 of a value of 723,000 Kr. to the Kattegat. The yield stated here undoubtedly gives a too low number of scores for the Kattegat. It will thus be seen from the fishery-reports, that 53,253 scores caught by cutters in the Kattegat cost 105,368 Kr. This gives a value of ca 198 Øre per score. According to this calculation the yield of the Kattegat cutters' catch in the Kattegat would amount to ca. 365,000 scores. But after this there would only be left 79,000 scores for the Skagerak and the Hanstholm-Søndervig area: a too small number for the value of 384,000 Kr. The statistics for the cutter-fishery for 1902 seems to be rather defective.

The year 1902 is the first year for which the Danish fishery-reports offer statistics over the catch of plaice separately. For all the preceding years a part of flounders and dabs are included in the statements. For 1902 the yield of the flounder- and dab-fishery amounts for the Kattegat alone to ca. 144,000 scores and 60,000 Kr., or ca. 21 % of the total No. of scores (of the plaice, flounders and dabs) and ca. 5 % of the value.

For 1903 the yield of the Kattegat cutters' catch beyond the Skagen amounts to 671,000 Kr. When 1·4 % is subtracted, we obtain ca. 662,000 Kr. as the yield of the plaice-fishery. The Kattegat cutters' yield at Horn Reef amounts to ca. 625,000 kilo. of a value of 178,000 Kr. When the weight per score is calculated to be 5·1 kilo., we get ca. 123,000 scores. The Limfjord cutters' yield at Horn Reef is here calculated in a similar way as before stated to 208,000 kilo. of a value of ca. 32,775 Kr. If we subtract the 178,000 Kr. from the 662,000, we get 484,000 Kr., which represent the value of the yield for the Skagerak and Hanstholm-Søndervig area. It may be seen from the fishery-reports, that the price of 18,980 scores caught beyond the Skagen by Frederikshavn cutters was 271 Øre per score. If this is supposed to be the average price for the Skagerak and Hanstholm-Søndervig area, the number of scores from these areas will be ca. 179,000, and the number of scores caught beyond the Skagen by Kattegat cutters in total ca. 302,000.

For the year 1903 the yield of the plaice separately has been given in the statistics, but the yield of the flounders and dabs has not been stated.

For the years 1895—99 the yield of the Kattegat cutters' catch beyond the Skagen is calculated in a more simple and easy way than for the years 1900—1903. It is possible from the reports to provide sufficient information with regard to the average price for plaice captured by the Kattegat cutters beyond the Skagen for the years 1895—1899, but such information may not be derived from the reports for 1900—1903. This is owing to the fact, that the great majority of the plaice during the first-named period was caught in the Skagerak or in the Hanstholm-Søndervig area, where the plaice are proportionally large and valuable, while a very considerable part of the catch during the latter period falls to the Horn Reef area where the plaice are proportionally small and of no considerable value. The prices set forth in the reports for 1900—1903 under the heading "Opgørelse af Fiskeriet fra Kuttere etc." correspond to proportionately few plaice captured at the Horn Reef.

For the years 1885—1894 the material at hand, on which we have to base the calculation of the Kattegat cutters' catch beyond the Skagen is more incomplete than for the years 1895—1903. In the years 1895, 1896, 1897, 1899 and 1900 there was on an average about 60 % of the cutters from Skagen, Frederikshavn, Sæby, the Limfjord east of Løgstør, Grenaa, and Hov, which took part in the plaice-fishery in the seas beyond the Skagen, and each cutter landed from these seas on an average ca. 1800 scores. If we suppose that a similar percentage of the Kattegat-cutters has taken part in the fishery beyond the Skagen in each of the years from 1885 to 1894, and that the cutters took the same

catch as in the period from 1895 to 1900 we get the following result of the Kattegat cutter's fishing in the seas beyond the Skagen.

1885	58,000	scores of plaice
1886	59,000	— - —
1887	88,000	— - —
1888	108,000	— - —
1889	133,000	— - —
1890	171,000	— - —
1891	169,000	— - —
1892	155,000	— - —
1893	153,000	— - —
1894	160,000	— - —

The figures stated here are certainly very doubtful, but as the yield in the Kattegat is so great in proportion to what has been stated here, it is not of much importance for a survey over the Kattegat-fishery if the yield in the seas beyond the Skagen has been calculated some thousand scores too high or too low.

It will be noted, that the material which I have been able to use for the calculation of the Kattegat cutters' catch beyond the Skagen, has been rather deficient. There is here only question about finding figures which roughly correspond to the real yield.

By converting scores into kilo. the following figures have been employed: for 1897: 6, 1898: 6·9, 1899: 6·5, 1900: 6·4, 1901: 6·1, 1902: 6·5 (see p. 33). For the years 1895, 1896, and 1903 the weight has been reckoned to 6·4 kilo. per score: the average weight for the first quoted years taken together. For the years previous to 1895 I have not ventured, with the material at hand, to present any factor for converting scores into kilo. The average-weight is calculated only according to the fish caught by snurrevaad. The average weight of the plaice caught in gill-nets is possibly higher. The yield, on

The yield of the Danish plaice fishery in the Kattegat.

Year	No. of scores approximately	No. of kilo. approximately	Value in Kroner	Average price per kilo.	Remarks
1885	871,000				Flounders and dabs included
1886	655,000				— - — —
1887	702,000				— - —
1888	445,000				— - —
1889	546,000				— - -
1890	554,000				— - -
1891	431,000				— - —
1892	560,000				— - — —
1893	496,000				— - — —
1894	629,000				— - —
1895	680,000	4,400,000	747,000	0·17	— - — —
1896	765,000	4,900,000	1,079,000	0·22	— - —
1897	647,000	4,000,000	1,013,000	0·25	— - —
1898 [1]	890,000	5,900,000	1,491,000	0 25	— - —
1899	616,000	3,900,000	1,222,000	0·31	— - — -
1900	485,000	3,100,000	1,184,000	0·38	— - — —
1901	726,000	4,400,000	1,272,000	0·29	— - — —
1902 [2]	672,000	4,400,000	1,204,000	0·27	— - — —
1902 [2]	528,000	3,400,000	1,143,000	0·34	Only plaice
1903	537,000	3,400,000	1,166,000	0·34	— —

[1]) This yield is stated a little too high (see p. 54).

[2]) This yield is probably stated too low (see p. 55—56).

the other hand, comprises some flounders and dabs, whose average weight per score is considerably less than the employed one. It is on the whole my impression, that the employed average weight is rather too high than too low for all the years, where flounders and dabs are included.

In order to compare the yield for 1902 with that of the previous years the average weight of the 144,000 scores of flounders and dabs is here reckoned to be the same as the average weight of the plaice (6·5 kilo per score). In reality the weight of the flounders and dabs are probably not more than ca. 3 kilo. per score.

A cutter's average catch per year.

In the tables below a survey is given over the yearly yield of the plaice-fishery for a number of Kattegat cutters. These tables are based on information in the cutters' journals, which have been stated in the fishery-reports, so that we here have to deal with figures, which must be regarded as reliable. The first represented table comprises cutters, which have fished inside as well as beyond the Skagen. The last table only comprises cutters, which have fished in the Katteget alone. It appears from both tables, that there has been a maximum in the cutters' catch in the period from 1895—1898, and that the succeeding as well as the preceding period show a considerably smaller catch. The average yield per year appears as follows:

For the Kattegat cutters, which have fished inside as well as beyond the Skagen. No. of scores		For the Kattegat cutters, which have fished only in the Kattegat. No. of scores	
1890—1894	3049	1890—1894	2804
1895—1899	4024	1895—1899	3735
1900—1903	2945	1900—1903	2965

In comparison with the period from 1895—1899 the period from 1900—1903 shows a very considerable decrease in spite of the great increase in the intensity of fishing, which the last period has to show. If we could employ the same fishing unit for all the years, we might possibly see, that the period from 1895 to 1899 gave no more plaice per unit than the period from 1890—1894 [1]).

Average catch per year for Kattegat cutters, fishing both in the Kattegat and beyond the Skagen.

Year	No. of cutters forming the basis of the calculation	Average catch per year and per cutter. No. of scores of plaice
1890	13	2812
1891	17	3082
1892	15	3176
1893	14	2525
1894	13	3650
1895	14	4418
1896	11	4329
1897	46	3452
1898	29	4592
1899	30	3330
1900	26	2167
1901	9	2774
1902	46	3671
1903	26	3168

[1]) See W. Garstang: "The impoverishment of the Sea". Journ. Mar. Biol. Assoc. VI. 1900 -1903, Plymouth, and Henking: "Die Befischung der Nordsee durch deutsche Fischdampfer". Mitt. d. Deutschen Seefischerei-Vereins No. 1. 1901.

Average catch per year for Kattegat cutters fishing only in the Kattegat.

Year	No. of cutters forming the basis of the calculation	Average catch per year and per cutter. No. of scores of plaice
1890	6	2977
1891	9	2368
1892	3	2475
1894	5	3393
1895	10	4533
1896	12	3970
1897	15	3605
1898	23	4186
1899	17	2383
1900	21	2151
1901	7	3179
1902	17	c. 3532
1903	2	2998

A cutter's average catch per fishing day.

We find an expression for the state of the fishery in the Kattegat, when we examine a cutter's average catch per fishing day. In the Danish fishery-reports a series of information is set forth regarding the yield of the catch per fishing day for the years from 1880—1896. It is, however, to be regretted, that no more considerable material has been provided. For several of the years so few fishing days have been stated that the statement very well may originate from 1 or 2 cutters, and we can by no means feel sure that their catches represent the average catch.

For the years 1898—1902 information of the catch per fishing day has been provided for a considerable number of days by Captain HANSEN.

For the years, where the yield of several hundreds of fishing days or more has been given, the statement is undoubtedly most valuable and gives on the whole a good idea of the average catch. In the first instance we may here be sure, that the statements originate from several different cutters. Secondly we know, that all cutters will seek the grounds, where they get the richest catch. It is of great interest to compare the total yield for a series of years with a cutter's average catch per fishing day for the same series of years. Where the statistics over the total yield are at hand, the amount of fishing and the intensity of fishing are rather uncertain factors, when we compare the yield for the different years. In the statistics over the yield per fishing day, the amount of fishing is a proportionately certain factor, while it is here uncertain, whether the number of fishing days, we have to deal with, is considerable enough to represent all fishing days for all cutters fairly well. If we regard the yield per fishing day for the years 1880—1902 a peculiar undulating movement appears. We have a maximum for the years 1880—1885, a minimum for the years 1886—1894, a maximum from 1895—1898, and a minimum from 1899—1902. The same undulating movement may be traced, if we regard the total yield stated on p. 57, in spite of the fact, that the calculation of the total yield mainly is based on a material different from that mentioned here.

It will thus be seen here, that 1885 has been an especially rich year. It has given a considerably greater yield than any of the years 1886—1894. The table furthermore shows, that the average catch per year has been considerably greater for the period from 1895—1898 than for the periods from 1886—1894 and 1899—1903. The plaice-fishery in the Kattegat has probably rendered a great total yield in scores in all the years 1880—1885 as in the years 1895—1898.

When regarding the table over a cutter's average catch per fishing day, it must be remembered, that the cutters from 1880—89 were af the old type without motor or screw. Since 1890 a very considerable increase in the fishing power of each cutter has taken place (see p. 52—53).

A cutters' average catch per fishing day.

Year	Aalborg Bay [1])		North of Læsø [1])		The whole Kattegat [1] & [2])	
	No. of fishing days forming the basis of the calculation	Average catch per day in scores	No. of fishing days forming the basis of the calculation	Average catch per day in scores	No. of fishing days forming the basis of the calculation	Average catch per day in scores
1880	103	61·1	46	59·3	149	60·6
1881	88	62·9	46	43·0	134	55·9
1882	100	79·0	47	47·0	147	68·8
1883	68	75·6	60	48·7	118	64·2
1884	82	85·9	64	56·3	146	72·9
1885	146	62·2	324	53·3	470	56·1
1886	144	52·0	414	39·4	558	42·6
1887	152	34·8	267	49·1	419	44·0
1888	109	43·9	348	46·4	457	45·8
1889	108	32·2	98	28.5	206	30·5
1890	237	35·2	...	...	237	35·2
1891	173	33·2	...	...	173	33·2
1892	174	45·9	...	...	174	45·9
1893	62	30·0	...	...	73	31·9
1894	42	38·6	...	...	55	45·6
1895	373	80·8	...	...	423	81·4
1896	170	79·6	...	...	170	79·6
1897	...	...	...	...	64	86·8
1898	...	...	...	...	2077	64·1
1899	...	...	...	...	1675	43·8
1901	...	...	...	...	1005	43·6
1902	...	...	...	...	1635	48·1

Number of plaice caught per haul.

Another measure of the course of the fishery may be obtained by comparing the number of individuals per haul in the different years. Statistics for a longer series of years have not yet been provided with regard to this. I shall here restrict myself to a comparison between the number of scores per haul for the years 1887—1888 and the year 1902. For the years 1887—1888 the yield is based on statements from journals of 4 cutters of the old type without motor or screw. The length of the lines for the seines was at that time ca. 200—400 fms. For 1902 the yield is based on statements from 20 cutters of the new type with all modern improvements. The length of the lines was in this last case ca. 600—1000 fms., most frequently 700 à 800 fms.

The result of the comparison is as shown on p. 61.

From the table represented it will be seen, that the yield per haul in the Kattegat has not been much higher in 1902 than in 1887—1888 in spite of the considerable increase in the length of the lines and in spite of the fact, that the hauling of the seines took place far quicker in 1902 than in 1887. The area, over which the gear passed per haul, was in 1902, 2—3 times larger than in 1887—1888. From this we get the impression, that the number of plaice per square unit on an average has been considerably

[1]) According to the Danish Fiskeri-Beretning.
[2]) According to C. J. Hansen.

Locality	1887—1888		1902	
	No. of hauls forming the basis of the calculation	Average number of scores per haul	No. of hauls forming the basis of the calculation	Average number of scores per haul
Kattegat: Around Anholt	46	3·5	452	3·1
— Aalborg Bay	271	4·7	82	8·1
— North of Læsø	1614	5·6	184	7·3
— (all fishing grounds)	2880	4·7	8302	5·3
Skagerak: Off Rubjerg -Løkken	886	2·5	213	5·4
Off Svinkleven—Ruhjerg	815	2·7	136	5·4
— (all fishing grounds)	1165	2·7	564	6·1

lower in 1902 than in 1887—1888. With regard to the Skagerak it will be seen, that the catch per haul was considerably higher in 1902 than in 1887—1888.

Has the shore-fishery for plaice in the Kattegat been affected by the intense fishing on the off-shore grounds?

With regard to the Kattegat we notice the same phenomenon as for the Skagerak: that when the "snurrevaad-fishery" on the off-shore grounds had continued for some years the shore-fishery by gill-nets etc. began to decrease to an astonishing degree. This is of peculiar importance, when we remember, that the number of gill-nets, which were employed by the shore-fishery for plaice, seems to have increased in the lapse of the years from 1885—1903 in the seas east of the Skagen (see p. 36).

It will easily be understood, that the yield of the shore-fishery for plaice decreases, when a great amount of plaice are caught on the off-shore grounds, if we remember that the plaice do not constantly stay on the same place, but at certain seasons migrate from the off-shore grounds to the shore.

From the data in the official reports we can roughly separate the plaice caught on the off-shore grounds from those caught near to the shore. The "Storfiskeri" mentioned in the reports may namely be defined as the "snurrevaad-fishery" on the off-shore grounds, while the rest of the yield is due to the shore-fishery with gill-nets etc [1]). We obtain thus the result stated on p. 62.

It will be seen, that in the period from 1885—1887 the shore-fishery was of much more importance than in the period from 1888 to 1900. When the off-shore fishery for plaice from the large cutters had lasted a few years (from 1880—1887) the shore-fishery decreased very much.

Has the total yield in kilo. of the plaice-fishery in the Kattegat been greater in the past, than it is at present?

From the statistical data at hand we cannot give any exact answer to this question.

The yield in scores per year has been about the same in the period from 1885 to 1903, and it is not probable, that the yield has been greater previously to this period. There is, however, reason to believe, that the average weight per score formerly was greater, than it is at present.

By means of the statistics at hand we cannot show, that the average weight of the marketable plaice from the Kattegat has decreased. Detailed information with regard to the weight of plaice per score is only at hand for the years 1897—1902, and the average weight of the plaice has not decreased during these years [2]). Dr. PETERSEN, who has followed the plaice-fishery in the Kattegat for more than 20 years, maintains however, on the basis of his own experience, that the number of large plaice in the Kattegat has been considerably reduced since the beginning of the eighties [3]) and there is every reason to believe,

[1]) From Skagen the "Storfiskeri" is carried on very near to the the shore.
[2]) Statistics with regard to the average weight of plaice in an earlier period will be worked out and published later on.
[3]) See Report of the Danish Biol. Station IV. København 1894.

Year	The yield of the shore-fishery in the Kattegat. (No. of scores caught by Gill-nets etc.	The yield of the off-shore fishery from Kattegat-vessels. No. of scores caught by "Snurre-vaad")	Percentage caught by the off-shore fishery
1885	521,000	408,000	44 %
1886	422,000	292,000	41 -
1887	c. 436,000	c. 354,000	45 -
1888	148,000	407,000	75 -
1889	228,000	451,000	66 -
1890	122,000	603,000	82 -
1891	c. 100,000	500,000	83 -
1892	143,000	572,000	80 -
1893	137,000	512,000	79 -
1894	144,000	645,000	82 -
1895	124,000	725,000	85 -
1896	101,000	782,000	89 -
1897	121,000	646,000	84 -
1898	95,000	868,000	90 -
1899	167,000	682,000	80 -
1900	120,000	515,000	81 -

that he is right. Almost all who have been engaged in the practical fishery, are of the same opinion. In this respect we have undoubtedly to do with the same phenomenon as in the North Sea and the Skagerak. As long as we do not know anything definitely with regard to the average weight per score in the years previously to 1897, we can not say with certainty, if there has been any decrease in the total yield of kilo. per year. I myself think it most probable, that the total yield in kilo. has been greatest in the first years after the beginning of the "snurrevaad-fishery": viz. in the period from ca. 1878 to 1885. It seems that a cutter's catch per day was very considerable in the period from 1880—1885 (see p. 60). I think, that in the period before 1885 there was a great constant stock of large plaice in the Kattegat, as there was in the North Sea and the Skagerak (see p. 40—44 and p. 47). But this great stock of large plaice soon disappeared, and since that time there was no decrease in the yield in kilo. per year.

The unfavourable circumstance at present with regard to the plaice-fishery in the Kattegat, and especially in the northern Kattegat, is, that the fishery essentially is based on small plaice (see p. 32—33), which still grow very quickly and are far from having obtained the highest market price per kilo[1]). An effective international size-limit has been wanting.

As the yield in scores of the plaice fishery in the years since 1885 seems to have kept about the same niveau, we may suppose, that the number of young plaice, which yearly grow up to marketable fish, has not been reduced in the lapse of the years.

Thus there is no evidence to indicate, that the number of young plaice in the Kattegat has decreased. But from this fact we can by no means draw the conclusion, that we everywhere in the Kattegat may find as many young plaice as the space and life conditions will permit.

[1]) The price for plaice landed in Frederikshavn from the Skagerak and the northern Kattegat in the period from July 1st to December 31st, 1904 was as follows (compare p. 28):

Weight per score	Price per score in Kroner	Price per kilo. in Kroner	No. of scores for which the price has been stated	No. of statements about price forming the basis of the calculation	Weight per score	Price per score in Kroner	Price per kilo. in Kroner	No. of scores for which the price has been stated	No. of statements about price forming the basis of the calculation
4 kilo.	0·53	0·13	80	3	7 kilo.	3·50	0·50	86	2
4·5 —	0·79	0·18	327	9	7·5 —	4·37	0·58	110	3
5 —	1·04	0·21	223	4	8—8·5 —	4·50	0·55	165	4
5·5 —	1·67	0·30	447	6	9—9·5 —	5·20	0·56	530	5
6 —	2·34	0·39	557	6	10 —	6·08	0·61	185	3

Has it answered for private persons to invest so much money, as has been done, in procuring the modern cutters with all the modern fishing material?

To this question we must answer in the negative. Dr. PETERSEN has already in 1894 arrived at the conclusion that the plaice-fishery in the Kattegat was overcapitalized[1]), and the years, which have passed since that time, have quite proved his opinion to be right. It has been made evident, that it does not pay to invest money in the large modern Kattegat cutters, in spite of the fact that they need not keep entirely in the Kattegat, but have been able to fish in the Skagerak and in the North Sea in case they might find a richer catch there. I have at hand accounts for the years 1898—1903 from one of the joint-stock fishery companies in Frederikshavn, and these accounts most plainly show, what a bad economical undertaking the cutter-fishery in the Kattegat has been. A few data for the years 1898—1903 will sufficiently prove this.

1898. The share capital is 46,320 Kr. The company has shares of a value of 44,630 Kr. in 28 cutters. The profit of the shares is stated to 2·625 Kr., but owing to different accidents the share-holders were paid no profit.

1899. The share capital is increased to 57,320 Kr. The company holds shares in 30 cutters. The value of these shares is stated to 56,830 Kr. The profit of the shares is calculated to 395 Kr., but the share-holders are paid no profit.

1900. The share capital is 57,820 Kr. The company holds shares in 27 cutters. The shares have a nominal value of 56,230 Kr. The profit of the shares is calculated to 740 Kr. A loss is stated to 700 Kr. The share-holders are paid no profit.

1901. The share capital is 57,820 Kr. The company holds shares in 27 cutters. The value of the shares is put down as 56,250 Kr. The profit of the shares is stated to 1169 Kr. No profit is paid to the share-holders.

1902. The share-capital is 57,820 Kr. The company has shares in 25 cutters. The value of the shares is stated to 51,630 Kr. The profit of the shares is stated to 994 Kr. Various losses have been stated to 3160 Kr. No profit is paid to the share-holders.

1903. The share-capital is 57,820 Kr. The company has shares in 25 cutters. The value of the shares is stated to 51,630 Kr. The profit of the shares is stated to minus 3647 Kr. Various losses is stated to 4848 Kr. No profit is paid to the share-holders.

In reality the state of matters is still more unfavourable than the facts stated here prove. In the lapse of years several serious items have been added.

From one who is exceedingly well acquainted with the matter, I have received the communication, that the affairs hardly run more smoothly for the other joint-stock fishery companies in Frederikshavn.

Thus it is without doubt, that in spite of the great rise in the prices of plaice per kilo., which the last twenty years have brought on, our cutter-fishery in the Kattegat has of later years not paid at all for the men, who have invested their money in it. As the fishery is carried on now, we find in the Kattegat and Skagerak too few good marketable plaice in proportion to the many cutters, which pursue them.

5. The Danish plaice-fishery in the Belt Sea.

The Danish plaice-fishery in the Belt Sea is not very considerable. It amounts to ca. 1,400,000 kilo. per year, and this comprises even the flounders and dabs. Inside the different parts of the Belt Sea we find considerable differences both with regard to the size, appearance and quality of the plaice, but nowhere in the Belt Sea are the plaice of such an excellent quality as the medium-sized ones from the

[1]) Report of the Danish Biol. Station IV p. 48.

northern Kattegat, the Skagerak, the North Sea and the Limfjord, where the salinity of the water is higher. According to the information regarding the weight of the plaice on p. 34 the average weight per score of marketable plaice from the Belt Sea must be supposed to be ca. 5 kilo. If we compare the yield of the plaice-fishery from the Belt Sea with that from the Kattegat (p. 57) some very characteristic differences will appear, of which the following should be noticed.

a. The yield in scores of the Kattegat fishery had already in 1885 — or possibly still earlier — reached its maximum and has since that time kept rather constant. With regard to the Belt Sea the yield has increased fairly evenly up to the present time.

b. While the price per score of plaice from the Kattegat and Skagerak increased with ca. 100 % in the years from 1885—1903, the price of the Belt Sea plaice has during the same time not changed essentially.

The table below also comprises the yield of the plaice-fishery in the Baltic, properly so called. As mentioned before, this yield is very inconsiderable, and the plaice here is of a still more inferior quality than in the Belt Sea.

For the year 1888, 69,102 scores of a value of 60,588 Kr. have been stated for "Jyllands Østkyst mod Syd"; out of this, 28 % of the scores and 21 % of the value fall to the Belt Sea, and the rest to the Kattegat. A similar distribution has in the statistics below been supposed also to hold good with regard to the years 1885, 1886 and 1887. Statistics over the catch of plaice alone are only at hand for the two years: 1902 and 1903. For the year 1902 the total yield of plaice, flounders and dabs amounted to ca. 294,000 scores and 271,000 Kr. Of this come to flounders and dabs ca. 143,000 scores and 77,000 Kr. or ca. 49 % of the number of scores and ca. 28 % of the value.

The "snurrevaad" was, according to Dr. Petersen, introduced into the Belts in the years from 1891—1893 and on the German shore of the Belt Sea in 1886 [1]). The snurrevaad-fishery on the fishing-ground south of Sprogø began in 1898, after Dr. Petersen had drawn the fishermen's attention to the ground [2]). In later years motors have been introduced in several of the small boats used for the plaice-fishery.

The yield of the Danish plaice-fishery in the Belt Sea (Bælthavet) and the Baltic.

Year	No. of scores	Value in Kroner	Average price per score Øre	Remarks
1885	85,000	70,000	82	Flounders and dabs included
1886	98,000	89,000	91	—
1887	117,000	107,000	91	—
1888	124,000	109,000	88	—
1889	133,000	132,000	99	—
1890	147,000	147,000	100	—
1891	154,000	138,000	90	—
1892	151,000	134,000	89	—
1893	134,000	112,000	84	—
1894	162,000	124,000	77	—
1895	156,000	122,000	78	—
1896	174,000	132,000	76	—
1897	174,000	110,000	63	—
1898	181,000	153,000	85	—
1899	269,000	192,000	71	—
1900	225,000	209,000	93	—
1901	271,000	285,000	105	—
1902	294,000	271,000	92	—
1902	151,000	194,000	128	Only plaice
1903	155,000	166,000	107	—

[1]) Dansk Fiskeriforenings Medlemsblad. 1893. p. 30.

[2]) Dansk Fiskeriforenings Medlemsblad. 1901. p. 484—485

The fluctuations in the yield of the Danish plaice-fishery in our various seas.

It appears from the facts stated above, that there are considerable fluctuations in the yield of the plaice-fishery in all our seas. If we compare the yield from our various seas, it is immediately obvious, that in each case we have to deal with different maxima and minima independent of those of the other seas.

On the table below, Esbjerg represents the eastern part of the North Sea, especially the Horn Reef area, whilst the Skagen represents the boundary between the Skagerak and Kattegat.

In the year 1892 a very rich fishery was carried on from the Skagen, while the Kattegat, the Belt Sea and the Limfjord have an average yield to show. In 1893 the fishery from Esbjerg was very rich. Contemporaneously the yield from the Skagen and the Belts show a minimum, while the Limfjord exhibits a good average-catch.

In 1895 the Esbjerg fishery shows a pronounced minimum, while the fishery in the seas east of the Skagen renders a good average yield.

In the years 1896 and 1897 the Limfjord fishery renders an extraordinary small yield, but contemporary with this our other seas give a fairly good yield.

In 1898 the yield of the plaice-fishery in the Kattegat and from the Skagen was very great, but for the Limfjord it was hardly an average year, and with regard to Esbjerg the year was far below the average.

The year 1900 is an especially unfavourable year for the Kattegat and for the Skagen fishery. For the Limfjord fishery the year is on the contrary a very good year, for Esbjerg it is a little below the average.

In the year 1901 the Limfjord fishery gives an extraordinary small yield. The fishery in the Kattegat and in the Belt Sea is on the other hand very favourable.

The year 1902 renders the greatest yield of the Esbjerg fishery, that ever was known. At the same time the fishery from the Skagen and Kattegat is only tolerably good.

In 1903 there is a great decrease in the yield of the plaice-fishery from Esbjerg compared with 1902. At the same time the yield for the Limfjord shows a great increase.

Year	Esbjerg	Skagen	The Limfjord		The Kattegat (exclusive the Skagen)	The Belt Sea
	No. of kilo.	No. of scores	No. of kilo.	Value in Kr.	No. of scores	No. of scores
1890	.....	52,000	.....	253,000	502,000	147,000
1891	461,000	57,000	.....	228,000	374,000	154,000
1892	942,000	91,000	.....	301,000	469,000	151,000
1893	1,437,000	47,000	.....	310,000	449,000	134,000
1894	1,154,000	70,000	.....	320,000	559,000	162,000
1895	586,000	100,000	.....	300,000	580,000	156,000
1896	1,241,000	172,000	.....	229,000	593,000	174,000
1897	1,305,000	172,000	.....	210,000	475,000	174,000
1898	1,028,000	257,000	1,062,000	278,000	633,000	181,000
1899	1,813,000	150,000	.....	291,000	466,000	269,000
1900	1,524,000	61,000	1,355,000	311,000	424,000	225,000
1901	1,847,000	104,000	671,000	196,000	622,000	271,000
1902	2,648,000	155,000	1,227,000	332,000	517,000	294,000
1903	1,512,000	153,000	1,618,000	496,000		

Total yield of the Danish plaice-fishery.

The statistics do not comprise information about all the yield of marketable plaice from the Danish vessels. Year by year the statistics become more comprehensive: a fact which plays a great rôle when we compare the yield for a long series of years. As yet we want for instance statistical information with regard to the following factors.

I. The yield, which cutters from the seas beyond the Skagen (especially from Esbjerg) land in the ports east of the Skagen.

II. The yield of the Danish steam-trawlers' catch in the seas at Denmark. The number of such trawlers, fishing in the Danish seas, has not in any year amounted to more than 3, and in certain years no Danish steam-trawler has fished at the coasts of Denmark.

In the tables below over the total yield in kilo. and Kroner, the yield in the year 1903 for the Kattegat and the Belt Sea comprises only plaice. For the preceding years the yield also comprises flounders and dabs. The Kattegat cutters' catch beyond the Skagen has in the table over the yield in Kr. been counted with the Kattegat yield for the years 1887—1894.

Total yield of the Danish plaice-fishery in kilogram.

Year	The North Sea and the Skagerak	The Limfjord	The Kattegat	The Belt Sea and the Baltic	Total No. of kilogram
1895	2,243,000	c. 1,500,000	4,400,000	780,000	8,923,000
1896	2,527,000	1,228,000	4,900,000	870,000	9,525,000
1897	2,066,000	1,097,000	4,000,000	870,000	8,033,000
1898	1,977,000	1,062,000	5,900,000	905,000	9,844,000
1899	4,264,000	1,329,000	3,900,000	1,345,000	10,838,000
1900	2,859,000	1,355,000	3,100,000	1,125,000	8,439,000
1901	3,738,000	671,000	4,400,000	1,355,000	10,164,000
1902	6,359,000	1,227,000	4,400,000	1,470,000	13,456,000
1903	4,068,000	1,618,000	3,400,000	775,000	9,861,000

Total yield of the Danish plaice-fishery in Kroner.

Year	The North Sea and the Skagerak	The Limfjord	The Kattegat	The Belt Sea and the Baltic	Total value in Kroner
1887	143,000	117,000	681,000	107,000	1,048,000
1891	79,000	228,000	964,000	138,000	1,409,000
1892	99,000	301,000	1,065,000	134,000	1,599,000
1893	116,000	310,000	971,000	112,000	1,509,000
1894	142,000	320,000	1,131,000	124,000	1,717,000
1895	525,000	300,000	747,000	122,000	1,694,000
1896	540,000	229,000	1,079,000	132,000	1,980,000
1897	531,000	210,000	1,013,000	110,000	1,864,000
1898	442,000	278,000	1,491,000	153,000	2,364,000
1899	747,000	291,000	1,222,000	192,000	2,452,000
1900	621,000	311,000	1,184,000	209,000	2,325,000
1901	877,000	196,000	1,272,000	285,000	2,630,000
1902	1,258,000	332,000	1,204,000	271,000	3,065,000
1903	1,191,000	496,000	1,166,000	166,000	3,019,000

The Danish exportation of Plaice.

The amount of the yearly exportation of plaice can only roughly be stated. It mainly takes place from the two ports Frederikshavn and Esbjerg. According to information from the Danish fishery-reports the exportation from these two towns is about as follows:

Year	Norway kilo.	Sweden kilo.	Germany kilo.	England kilo.	Total kilo.	Total value
1897	186,000	391,000	930,000	540,000	2,047,000	c. 700,000
1898	265,000	664,000	1,091,000	272,000	2,292,000	c. 800,000
1899	398,000	541,000	1,071,000	697,000	2,707,000	c. 1,000,000
1900	381,000	494,000	1,118,000	371,000	2,364,000	c. 1,000,000
1901	435,000	732,000	1,108,000	445,000	2,720,000	c. 1,200,000
1902	392,000	695,000	2,079,000	703,000	3,869,000	c. 1,700,000
1903	290,000	442,000	1,210,000	179,000	2,121,000	c. 1,000,000

Concluding Remarks.

Having regarded the development of the Danish plaice-fishery for a longer period, we shall now try to answer some of the questions, which present themselves with respect to the state of our plaice-fishery taken on the whole.

I. Has the yield in kilo. increased in proportion to the number of fishing vessels and their increased fishing-power?

With regard to the North Sea the state of matters seems to be rather favourable. It may here distinctly be noticed, that together with the increase and improvement of the fishing material, there has been a very great increase in the yield in kilo. (see p. 37 ff.). For the seas east of the Skagen and especially for the Kattegat, the question above may absolutely be answered in the negative. If we examine the statistics over our plaice-fishery in the Kattegat from 1885—1903, it will be seen, that the yield in scores has kept nearly on the same niveau. The yield has shown rather considerable fluctuations, but there is no question of any pronounced progress or decline. From the facts before stated it appears however, that the amount of fishing and the intensity of fishing in the Kattegat has increased immensely during the period from 1885—1903. With the modest gears, that were at disposal in the period from 1885—1889 the fishermen were able to catch as many plaice as were caught with all the modern gears in the years 1900—1903. This must be said to be a most discouraging result for all the energy and expense, which were employed in order to develop our plaice-fishery.

It is evident, that the productive power of the stock has been very limited, but rather constant. Thus it has become obvious, that it would be of far-reaching economical importance to find means to increase the stock of good marketable plaice. It will not be necessary to construct new gears in order to catch them.

II. Has it answered to spend so large a capital in procuring all the modern cutters as has been done?

It appears from the facts above stated (p. 63) that the cutters from Frederikshavn of late years have answered very badly for the men, who have invested their money in them, and we can hardly doubt the fact, that the same holds good with regard to most of our other cutters belonging to the ports east of the Skagen. However, even if private persons have derived no profit by investing money in the cutters, it is evidently an advantage to the country on the whole, that we have gradually got an excellent fishing-fleet for the plaice-fishery. Thus we have been enabled successfully to compete with the large foreign trawlers both in the Kattegat and in the shallow water of the Skagerak. At present we are not only able to provide our own market with plaice, but we may also take a considerable number to the market abroad (see the table above).

If the fishing material of the foreign fishermen was gradually improved, while we ourselves continued with the old-fashioned gears, the foreign fishermen would gradually take home almost all the fish even from our neighbouring fishing-grounds. In the North Sea we have as yet only conquered a small area with one single fishery-port as basis, but the rapid development of the plaice-fishery from this port in opposition to the stagnation of the plaice-fishery in the seas east of the Skagen call the attention to a future aim for Denmark in extending this fishery in the North Sea, at least when an effective international size-limit makes the stock of plaice more valuable.

Even if it must thus be supposed to be an advantage for the country, that we have got a fleet of modern cutters with great fishing-power, the thought presents itself, that our fishery on the off-shore-grounds (Storfiskeri) has received a too partial development into a fishery only based upon flat-fishes. It seems, as if Denmark had employed too much energy in developing the plaice-fishery and too little energy in developing the other fisheries on the off-shore grounds, for instance the haddock-fishery and the herring-fishery. On one side we evidently possess many more cutters, than we need in order to maintain our predominance with regard to the plaice-fishery in the Kattegat and the Skagerak. On the other side we have too few large vessels for the haddock- and the herring-fishery. In the Skagerak we find for instance during the winter and spring a considerable stock of haddock, of which the German trawlers land a great amount, while we hardly fish any of them. It should also be noticed that the Swedish herring-fishery in the Kattegat and the Skagerak is far more important than the Danish. An attempt to make our fishery a little more wide-ranging has been made during the very latest years, as two small steam-trawlers have begun to fish in the Kattegat and the Skagerak with Copenhagen as basis[1]). The species of fish which render the greatest yield in Kroner for these trawlers are: cod, soles, and plaice.

III. Does the stock of plaice in our seas yearly render a contingent of plaice to the market as great and valuable as it on the whole is able to render?

This question will undoubtedly have to be answered in the negative. By a more rational treating of the stock of plaice than the present one, the stock would evidently yield a far more valuable contingent to the market, than it does at present. As long as we find a large "accumulated stock" of medium-sized and large plaice, this will of course render the greatest yield, but such a stock can only last a short time when subjected to an intense fishery. The point is now to fish just such a part of the stock, that the yearly increase in the long run may be as valuable as possible. The question is to base the fishery just on that size of plaice, which will make the yearly yield as great as possible. In the present state of matters an essential part of the plaice-fishery is based upon fish of a weight of 2—6 kilo. per score. There is however every reason to believe, that it does not pay, at any rate not for most areas, to catch the fish, while they are so small and of so little value. It is beyond doubt, that the establishment of an effective international size-limit would prove an excellent way to increase the yield of the plaice-fishery. The most advantageous size-limit has not yet been settled, but the Danish marking-experiments in the Skagerak and the northern Kattegat plainly suggest, that a size-limit of 30 cm. would not be too high here. Near to the shore, where the fishery mainly is carried on by small boats, we frequently find great abundance of young plaice, which grow slowly, while proportionately few young plaice, which grow quickly, are met with far from the shore, where only large vessels fish. The possibility is not excluded, that it would be practical to establish a lower size-limit for plaice caught from the small vessels than for those caught from larger vessels. At any rate it will undoubtedly be practical to fix a lower size-limit for the small Baltic plaice in the Belt Sea and in the Baltic, than for the larger ones in the North Sea, the Skagerak and the northern Kattegat.

[1]) C. G. Joh. Petersen: "Kunne vi optage Konkurrencen med Udlandets Damptrawlere etc." Beretning fra den danske biologiske Station. XII. København 1904.

Another means of increasing the yearly yield of good marketable plaice we evidently possess in transplanting young plaice from areas, where they are overcrowded and grow slowly to areas, where they are scarce and grow rapidly.

The Danish marking-experiments form a good basis for adopting this course in future (see p. 22—23).

I wish to express my best thanks to the chairman for "Kommissionen for Havundersøgelser" Dr. C. G. Joh. Petersen for all the help he has rendered me during my studies of the biology of the fishes. To Captain C. F. Drechsel, Captain C. J. Hansen, Mr. S. Jørgensen, Mr. Cloos Lorentzen, Dr. H. M. Kyle, and Dr. Johs. Schmidt I am under great obligation for various communications. Dr. Kyle has been kind enough to read through the proofs.

Explanation of the Plates.

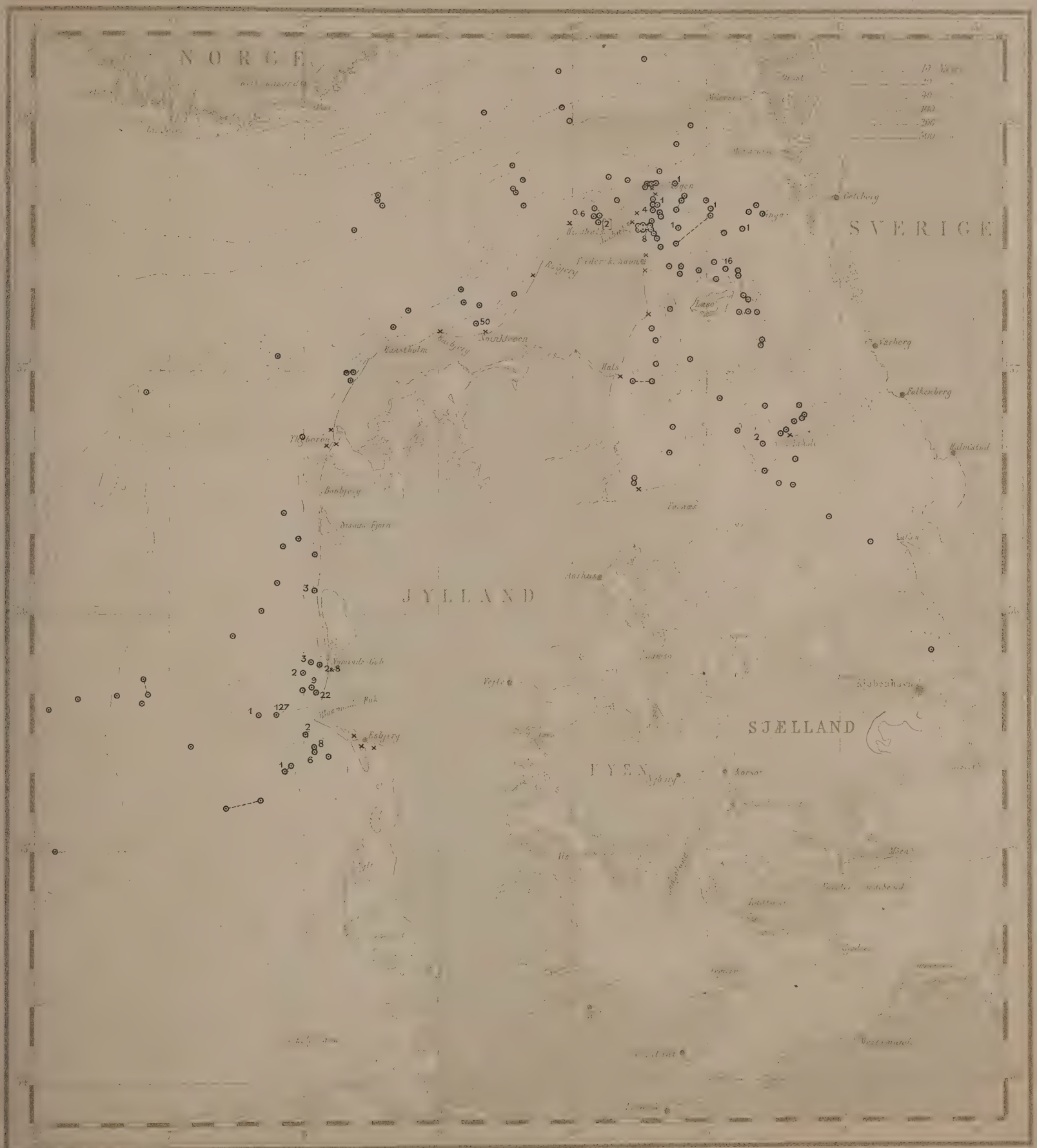
On Pl. I to V is indicated the number of plaice caught per hour from the "Thor" by the 50 feet ottertrawl. Each circle (or two with a line uniting circles) indicates a station. Where no figure is found at the circle, no plaice were caught. The figures in brackets are only approximately correct. The shore stations where plaice of the 0-Group have been caught are marked with ×. The dotted line on Pl. V off the west-coast of Jutland indicates the outer limit of the area, where most of the marked Danish plaice were recaught by Danes. West of this line most of the marked plaice were recaught by English trawlers (see Pl. X—XII).

On Pl. VI the size of plaice caught on the beach at Esbjerg is represented. It will be seen, that the young individuals here grow very slowly. The individuals of the I-Group are on an average only ca. 3 cm. larger than the individuals of the 0-Group (see p. 7).

On Pl. VII to IX is represented the size of plaice caught in the Horn Reef area (the North Sea). It appears, that the growth of the young individuals is here much faster than in the inshore waters at Esbjerg. The individuals of the I-Group are here on an average 6 à 7 cm. larger than the individuals of the 0-Group (see p. 8—9).

Pl. X—XII show the migrations of the marked plaice (see p. 10—18 and p. 24—26). The centre in the various circles indicates the place of liberation. The head of the arrows indicates the place of recapture. The figures at the arrow-heads indicate the number of months between liberation and recovery.

Da. means: recaptured by Danish fishermen
E. — — - English —
G. — — - German —
B. — — - Belgian —


NORGE
SVERIGE
JYLLAND
FYEN
SJÆLLAND
Skagen
Göteborg
Varberg
Falkenberg
Halmstad
Hals
Læsø
Aarhus
København
Esbjerg
Ringkjøbing Fjord
Nissum Fjord
Vejle
Odense
Korsør
Ringsted
Lolland
Møen
Bornholm
Gotland
Visby
Ystad
Malmö
Helsingborg
Landskrona
Halmstad
Laholm
Kattegat
Skagerrak
Nordsøen
Fiskerbanken
Rødbjerg
Bovbjerg
Hanstholm
Thyborøn
Nymindegab
Blåvandshuk
Fanø
Rømø
Sylt
Amrum
Helgoland
Eider
Kiel
Lübeck
Rostock
Warnemünde
Stettin
Swinemünde
Danzig
Memel
Libau
Windau
Mündung
Riga
Pernau
Reval
Hapsal
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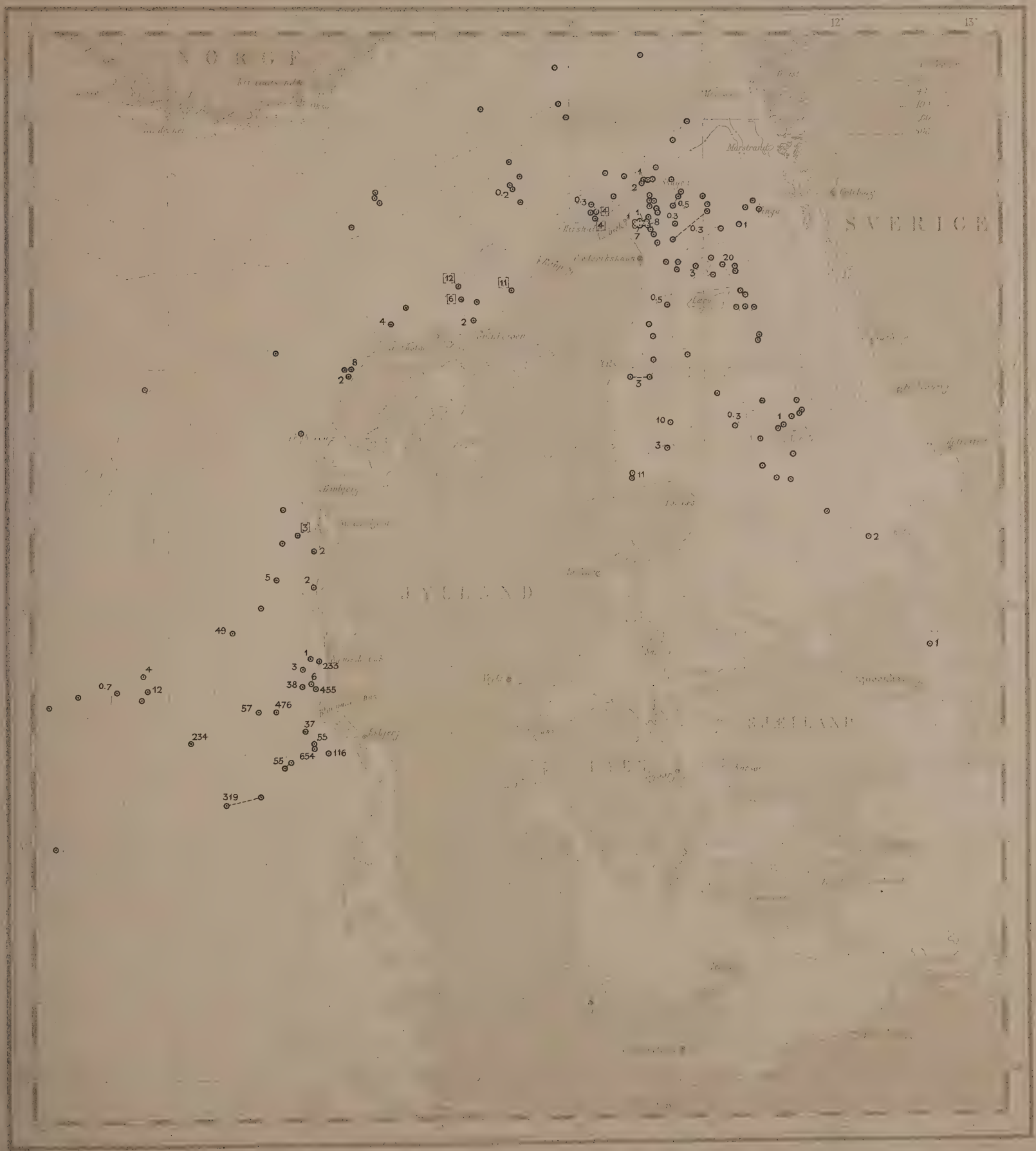
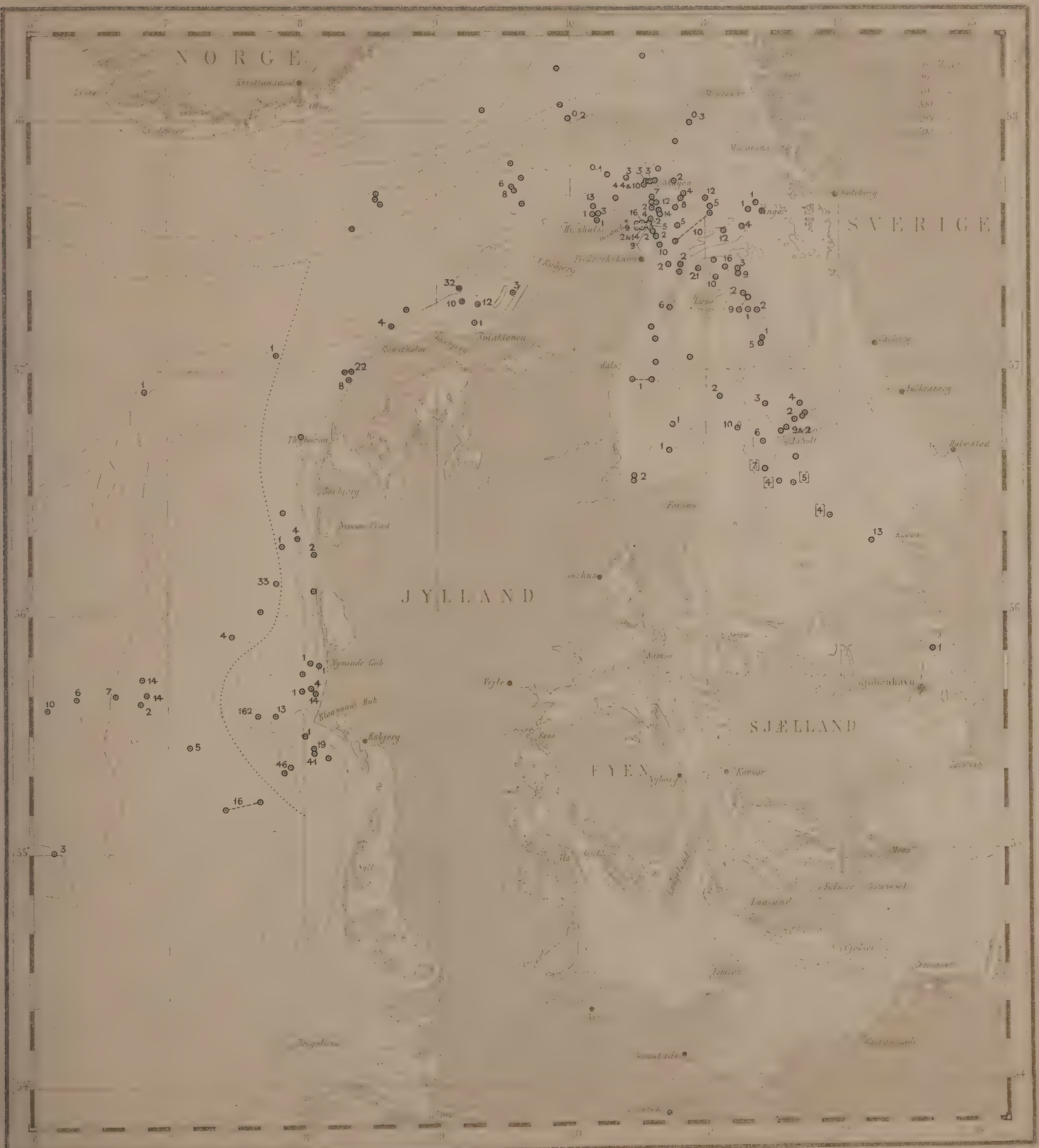
Faxe
Stevns
Kjøge
Ringkjøbing
Esbjerg



Number of plaice between 15—19 cm. caught from the "Thor" per hour (see p. 1—2).

ca. 1 : 2,000,000.

Number of plaice above 20 cm. caught from the "Thor" per hour (see p. 1—2).

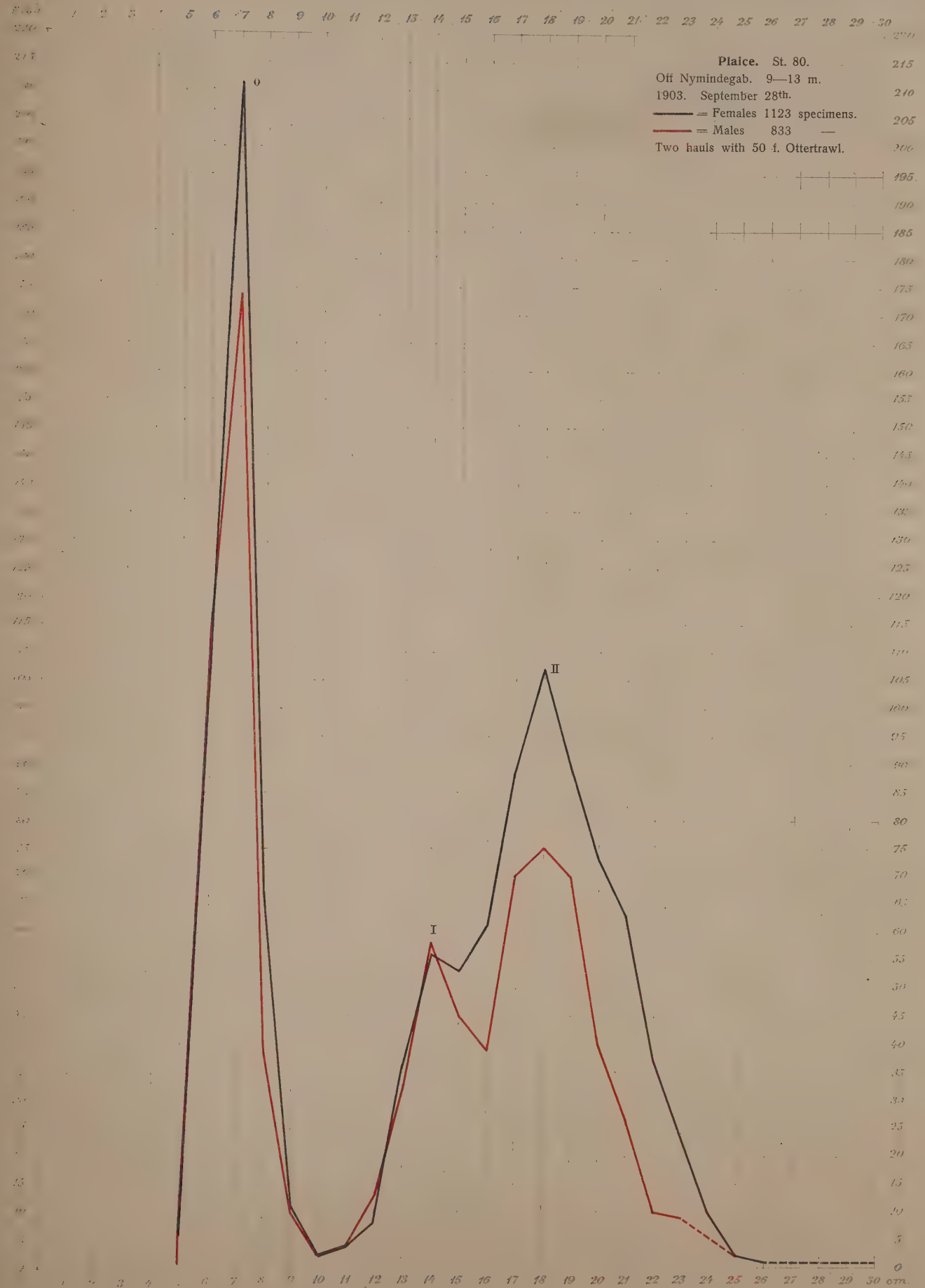


ca. 1 : 2,000,000.

Number of plaice above 26 cm. caught from the "Thor" per hour (see p. 1—2).

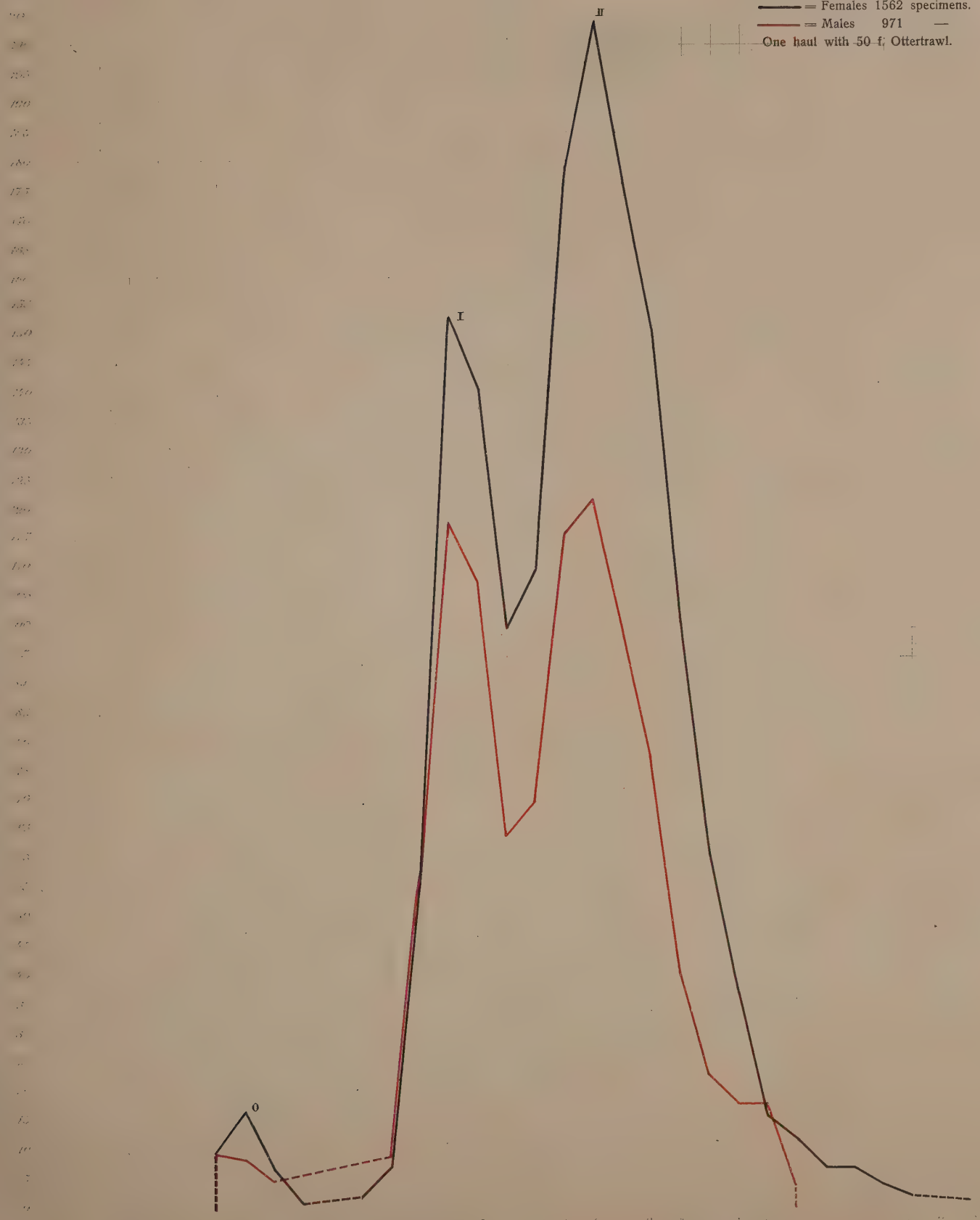
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
Plaice. St. 88.
Beach at Esbjerg. 0—1 m.
1903. October 5th.
= Females 371 specimens.
= Males 446 —
= Total 817 —
Two hauls with Eel-seine.
0
I
50
40

Axel F. Aamodt & Joh. Eliasl Kbhvn

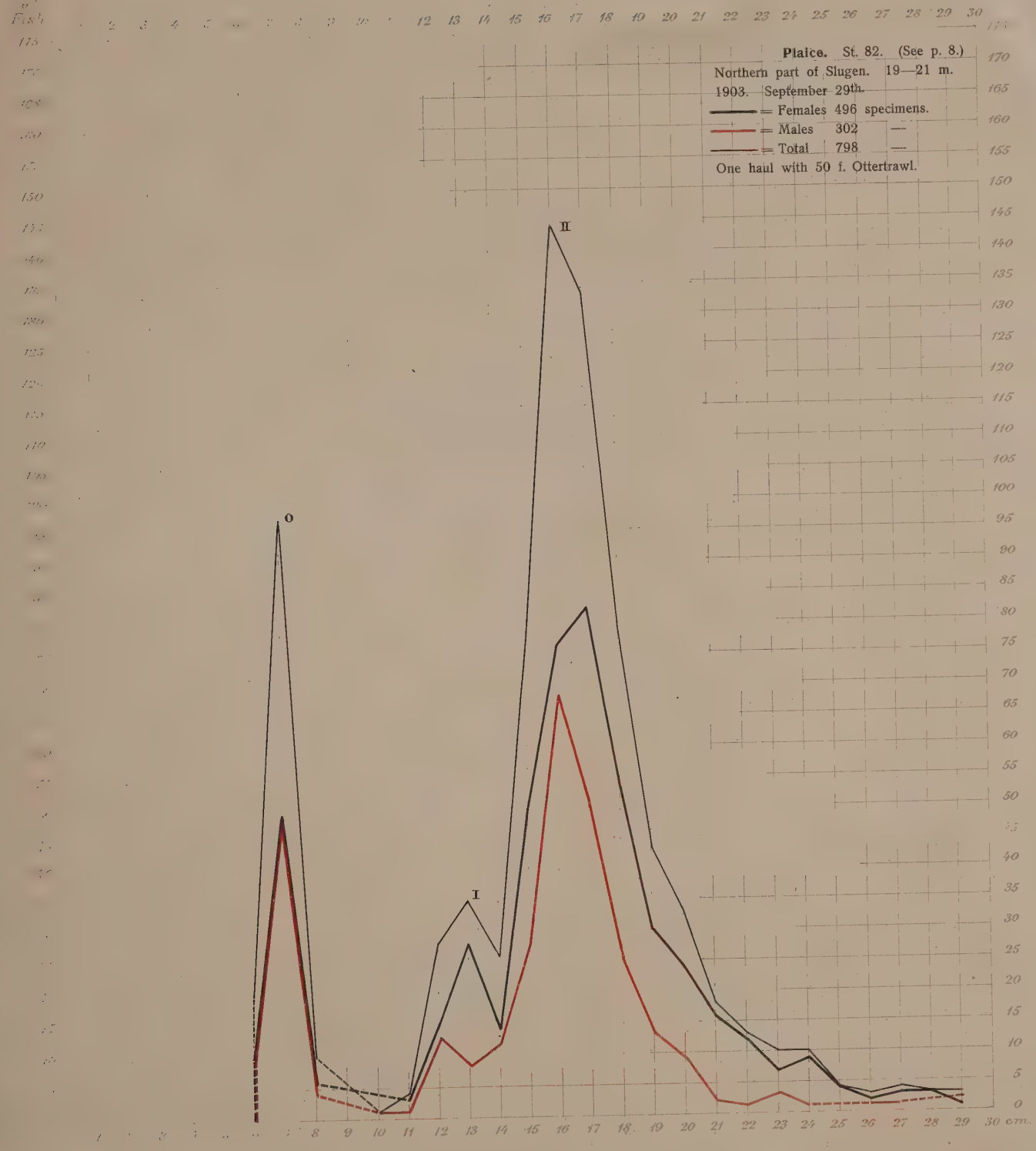


Axel E. Aumodt's lith. Etabl. Kbhvn

Plaice. St. 81.
Off Kærgaarde. 13—15 m.
1903. September 28th.
——— = Females 1562 specimens.
——— = Males 971 —
One haul with 50 f. Ottertrawl.

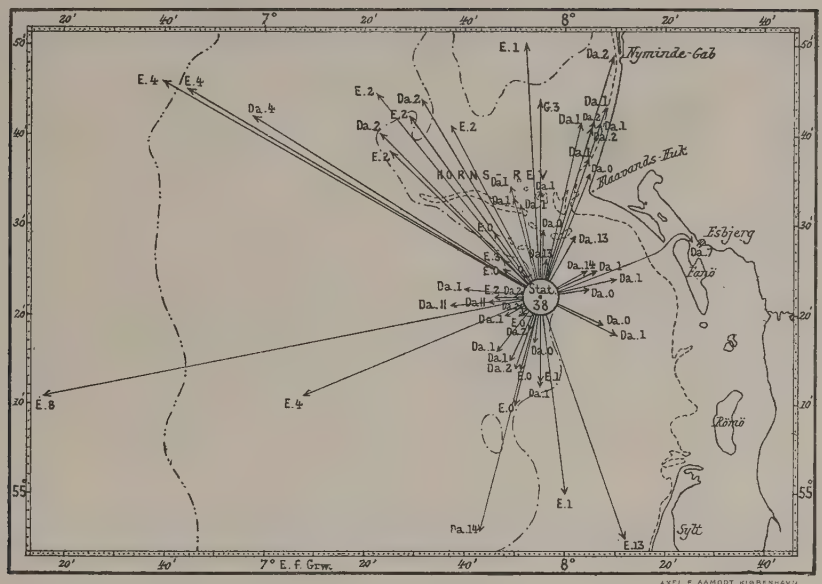


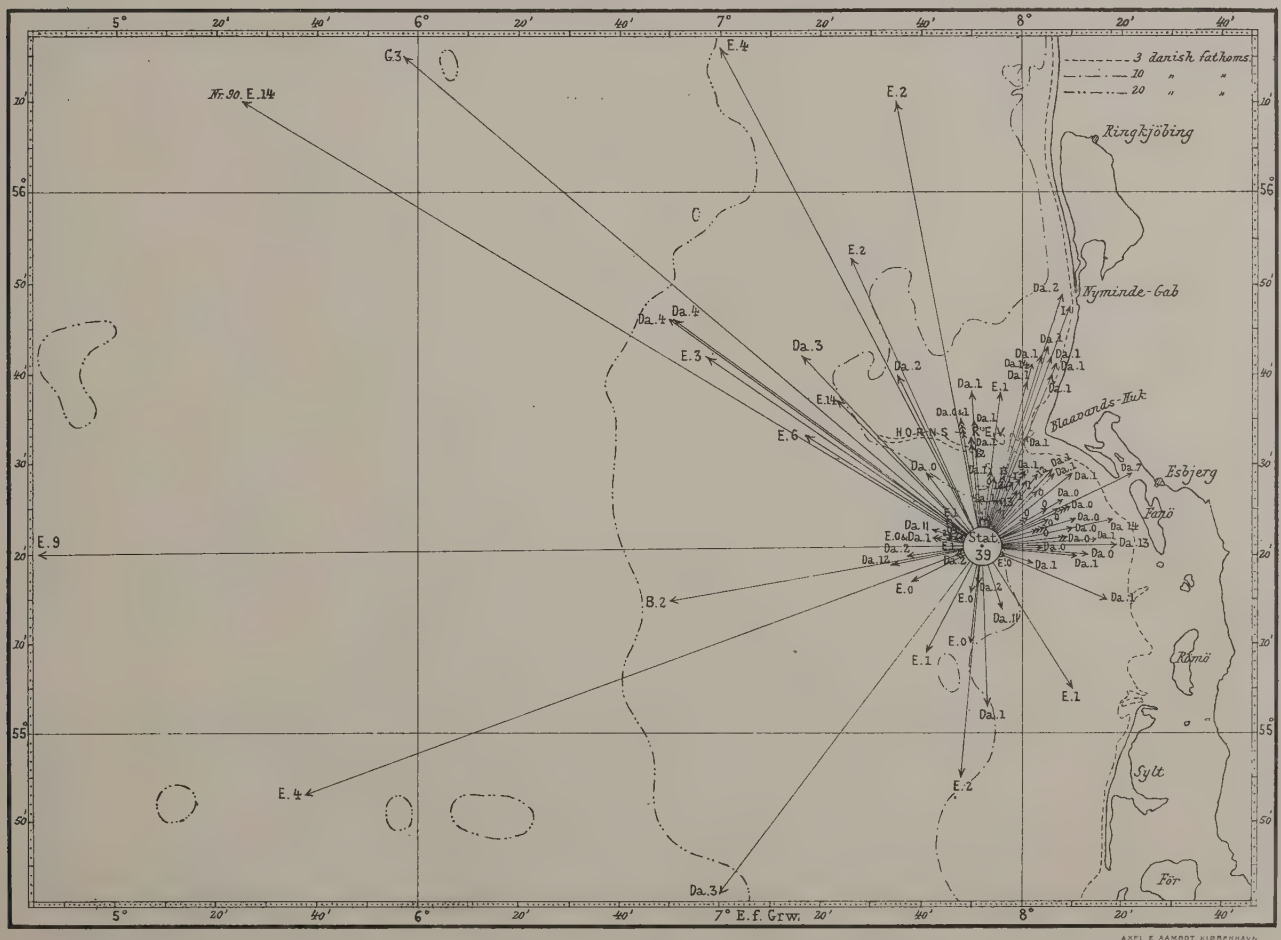
Aarel E. Aamodt's Ith. Etabl. Kbhvn



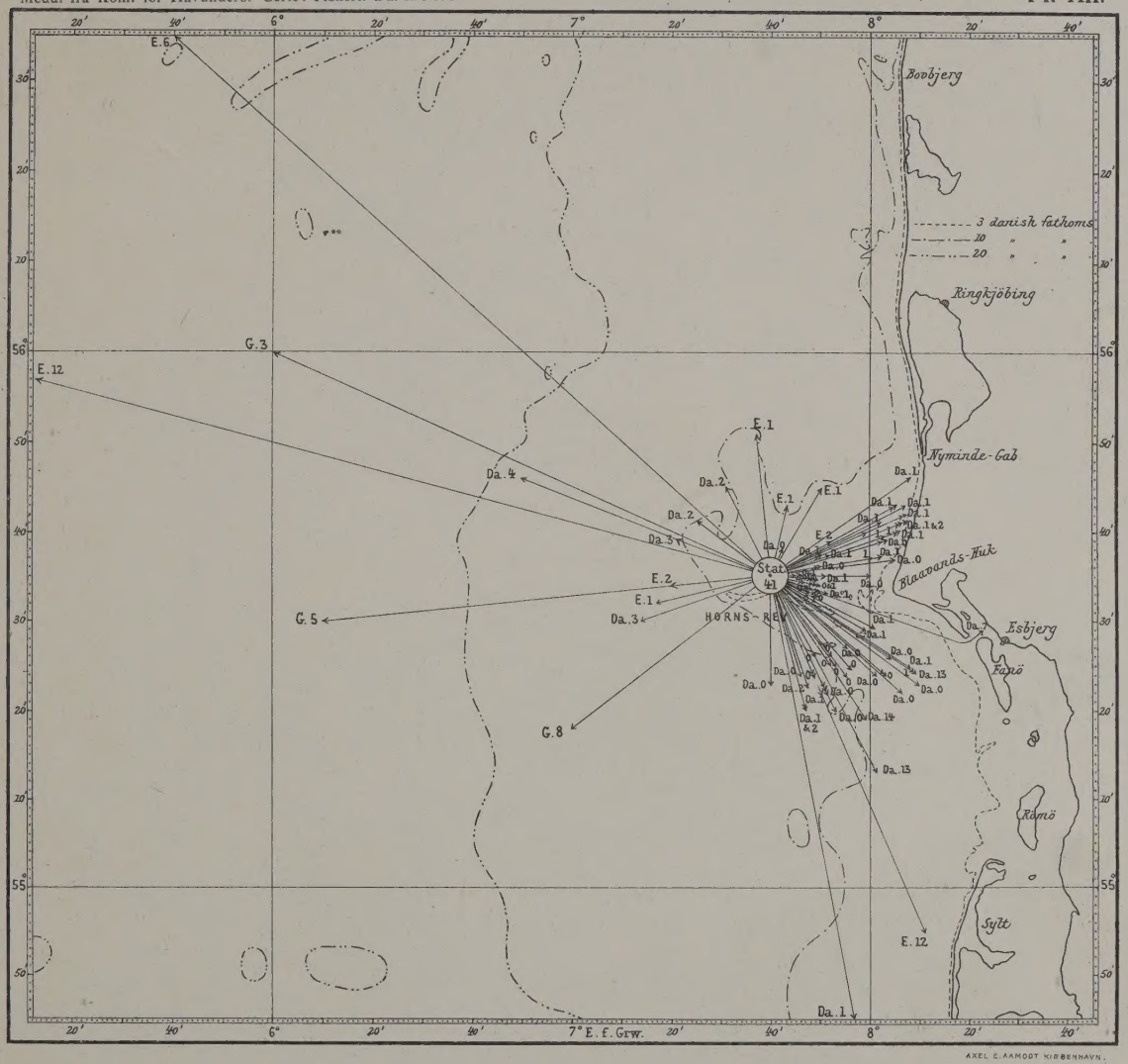
Axel E. Aamodt lith. Etabl. Kbhvn.

Migrations of Plaice. „Thor"s Marking-Experiments in 1903.





Migrations of Plaice. „Thor"s Marking-Experiments in 1903.



Migrations of Plaice. „Thor"s Marking-Experiments in 1903.